

# MODERN Machine Shop

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OCTOBER, 1944

# Contents

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**RALPH M. FRENCH**  
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## CONTENTS

Marine Engines By Hendy, II. By Howard Campbell	124
Use of Negative Rake Tools in Production of Aircraft Parts By J. Q. Holmes	138
26th Annual National Metal Congress and War Conference Displays	166
Officers and Trustees, American Society for Metals	170
Programs of the Technical Societies	172
List of Exhibitors Participating in the War Conference Displays	224
New Shop Equipment	310
Services Directory	390
"Where To Get It"	392
Cartoon	396
Over the Editor's Desk	398
Index to Advertisements	401

# ARMSTRONG



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# MODERN Machine Shop

OCTOBER, 1944

VOL. 17, No. 5

CINCINNATI, OHIO

## *We Present---*

— as the feature article in this month's issue — "Marine Engines By Hendy, II." In this, the second half of the article, the assembling and machining operations on the crankshafts are described; also treated are the machining and balancing operations on the rotor for an 8,500 h.p. steam turbine.

— on page 138 — "Use of Negative Rake Tools in Production of Aircraft Parts," written by Mr. J. Q. Holmes, Master Mechanic, Eastern Aircraft Division, General Motors Corporation, Linden, New Jersey. In this article Mr. Holmes tells how, upon experimenting with negative rake tools for milling, turret lathe and precision boring work, his company was successful in getting the "most of the best for the least" in the production of "Wilder Wildcat" fighter planes for the United States Navy.

— on page 166 — an announcement of the 26th Annual National Metal Congress and War Conference Displays to be held at the Public Auditorium, Cleveland, Ohio, October 16 to 20. Following pages present the Programs of the Technical Societies including the American Society for Metals, A.I.M.E. Metals Divisions, Society for Experimental Stress Analysis, American Welding Society, American Industrial Radium and X-Ray Society, Inc.; and a list of the exhibitors participating in the War Conference Displays.

— on page 310 — the "New Shop Equipment" department, followed by cartoon and other features.



Fig. 12—Removing a Crankshaft Web from the Hot-Oil Tank. It is Transported to the Shrinking Stand, Where It is Assembled to the Crankpin while Hot.

## Marine Engines By Hendy, II.

In this, the second half of the article, the assembling and machining operations on the crankshaft are described.

Machining and balancing operations on the rotor for an 8,500-h.p. steam turbine are included.

By HOWARD CAMPBELL

**T**HE Liberty Ship engine—a 2,500-h. p. triple-expansion reciprocating marine steam engine—is a giant two-story power plant weighing 137 tons. Its crankshaft alone weighs 20 tons and is an assembled job, the crankpins, thrust shafts, and webs being separate and individual pieces.

Six webs, each weighing 1800 pounds, are used in the assembling of

one shaft. When ready to assemble the webs to the shaft, the webs are moved, in sets of two, into special heating tanks containing a special heat-resistant oil that has been heated to a temperature of 550 degrees F. The webs are immersed in the hot oil for a period of three hours which is sufficient to bring them to the required amount of expansion.

While the webs are being heated, the journal pins, crankpins and thrust shaft are placed in position on the shrinking stand, the webs being spaced at the correct angles to each other by the use of height blocks. The shrinking stand holds the journal pins and thrust shaft in the correct alignment within limits of 0.005 inch. The tolerance before finish turning is 0.010 inch, and the holding bases of the stand are keyed to the bedplate to assure this accuracy of alignment.

The crankpins are brought to the shrinking stand in a semi-finished condition, the journal pins and thrust shaft being semi-finished to a tolerance of 0.050 inch, to be finished in the lathe after the shaft has been assembled. One of the principal secrets of successful crankshaft web assembly, according to Hendy engineers, is to have the webs in balanced relationship even though they may not be absolutely parallel.

When the webs have been heated sufficiently to bring them to the specified amount of expansion, the crew moves into action like a perfectly-

trained football team. A single web is hoisted from the heating tank, as shown in Fig. 12, and carried by the crane to the shrinking stand. As it is brought even with the end of the first journal two men, using bars, steer it onto the pin. At the same time a jack is placed under the web, as shown in Fig. 13, the jack being set at the approximate height to give the web the exact 120-degree angle required in relationship to the other webs.

With the first web in position, a second web is brought by the crane and maneuvered into position in the same manner. The stands of the shrinking stand are moved longitudinally as required to permit the entrance of the web, and as soon as the web is in position on the crankpin, the next journal pin is moved into the opposite end of the web. Height blocks are placed under the crankpin to assure correct positioning, and the jack is removed.

The same procedure is followed with each of the two remaining sets



Fig. 13 — Assembling a Web to the Crankpin after it has been Expanded by Heating in Hot Oil. A Jack is Set under the Web to Hold it at the Required 120 - Degree Angle to the Other Webs

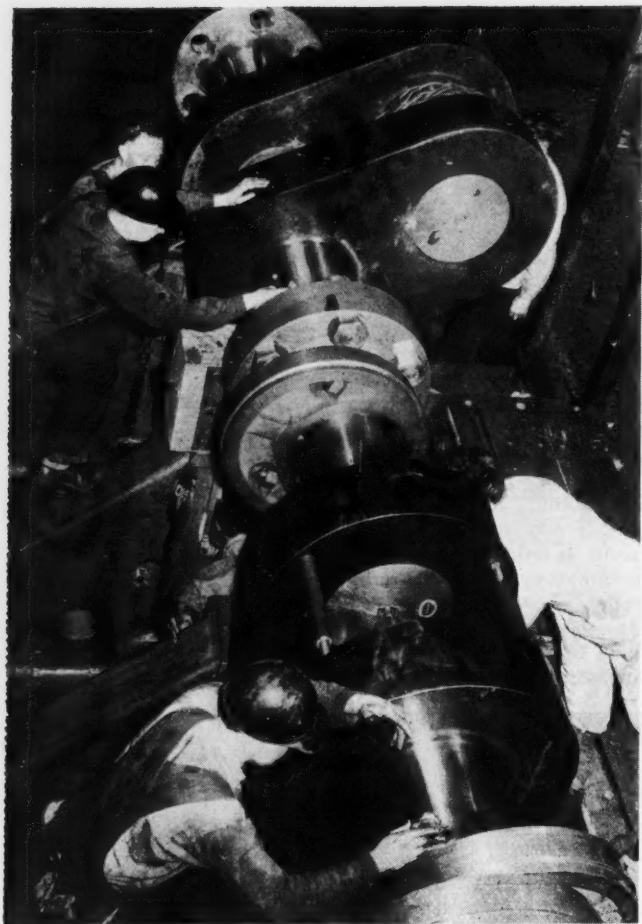


Fig. 14 — Assembling a Liberty Ship Engine Crankshaft on the Shrinking Stand. The Shrinking Stand Holds the Journal Pins and Thrust Shaft in Alignment within Limits of 0.005 Inch



period of twelve hours.

When the shaft has cooled, holes are drilled and reamed for dowels which are pressed into the holes to prevent the webs from slipping under the tremendous pressures to which they will be subjected in service.

The hole-drilling operation is performed with a portable drilling machine which can be clamped to the tops of a set of webs, as shown in Fig. 15. Power is derived from a

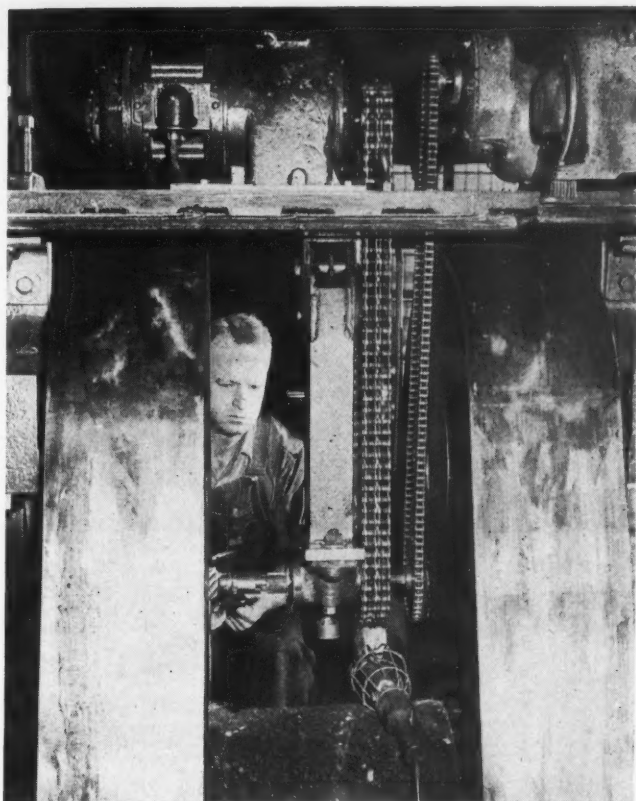
of webs. The time required to assemble a set of webs averages seven minutes, which is remarkably fast considering that the parts are large and heavy, that the webs must be brought by crane from the heating tanks, and that the assembling job must be done within comparatively close tolerances. The webs cool sufficiently to begin shrinking within thirty minutes after they have been anchored in place, and the completely-assembled shaft is left to cool for a

motor that is bolted to the base plate upon which the tool is mounted, the power being transmitted through a chain drive to the machine spindle. A gear motor is provided to feed the tool through the work, the power being transmitted through a light chain to the feed screw as shown in the illustration.

There are two inside and two outside dowels in each set of webs; thus the holes are drilled in sets of two. Following the drilling, the webs are

Assembling  
Ship Engine  
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Stand. The  
Stand Holds  
the Pins and  
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Inch

Fig. 15—Drilling and Reaming Holes for the Dowels which Maintain Correct Alignment of the Crankshaft Webs in Service, using a Special Handy-Built Portable Drilling Machine



tapped for Allen setscrews.

The illustration Fig. 16 shows the operation of milling the keyways for the eccentrics which are cut in the crankshafts with the aid of a portable keyway miller. An end milling cutter is used, held in a vertical spindle which can be fed by hand both vertically and horizontally so as to obtain the proper depth and length.

The tool is positioned on the shaft by means of a huge hinged clamp which locks around the shaft. Portable tools of the type shown and described here simplify the task considerably, because it is much easier to move such tools to the job than it would be to move huge work to the several machines.

Following the cutting of the keyways, the two major parts of the shaft are brought together on a lining-up stand and a portable line reamer is used to finish the flange bolt holes to size and in correct alignment. With this fixture, tolerances

under 0.001 inch are consistently achieved, permitting interchangeability of bolts.

Flanges are machined in pairs, and the matching sections are always kept together until their final assembly on the ship. After the flanges have been bolted together, with jacks installed between the webs to hold them in perfect alignment, the entire shaft is moved to the finishing department. Here counterweights are bolted to the webs, the shaft is swung into the big lathe shown in Fig. 17, and a smooth, even finishing cut is taken.

The illustration Fig. 18 shows the

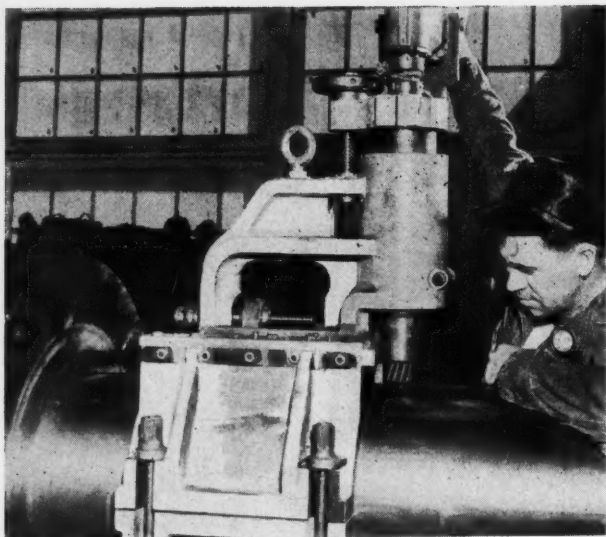


Fig. 16—Milling Keyways in the Crankshafts for Eccentrics, Using a Portable Milling Machine



der for a C-3, 8,500 h. p. steam turbine, using a 3-inch Geometric collapsible tap for the job. Such a tap eliminates possible damage to the thread, since it can be withdrawn without having to back it out as is the case with solid taps. The

operation of tapping the steam intake valve on a high pressure cylin-

radial drilling machine is ideal for this operation, also, because in addition to

Fig. 17—With Counterweights Bolted to the Webs, the Crankshaft is Swung into this Lathe and the Finishing Cut is Taken

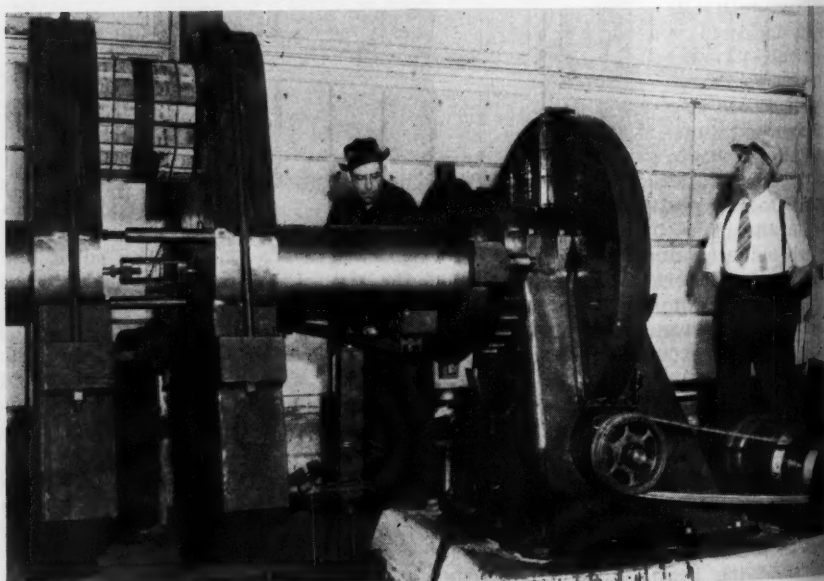


Fig. 18—Machinist Taps the High End of a 8,500 h. p. steam turbine, using a 3-inch Geometric collapsible tap for the job. Such a tap eliminates possible damage to the thread, since it can be withdrawn without having to back it out as is the case with solid taps. The

having necessary tap, in stant direct

Ins ventio ting w the ro sure c h. p. Hend tion and s upsid Fig. 2 seve make ly vis it ten ter an tool f

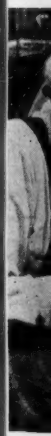




Fig. 18—Using a Radial Drilling Machine and Collapsible Tap to Tap the Steam Intake Valve on a High Pressure Cylinder for an 8,500 H.P. Steam Turbine



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having the power necessary to drive such a large tap, it has practically instantaneous control in all directions.

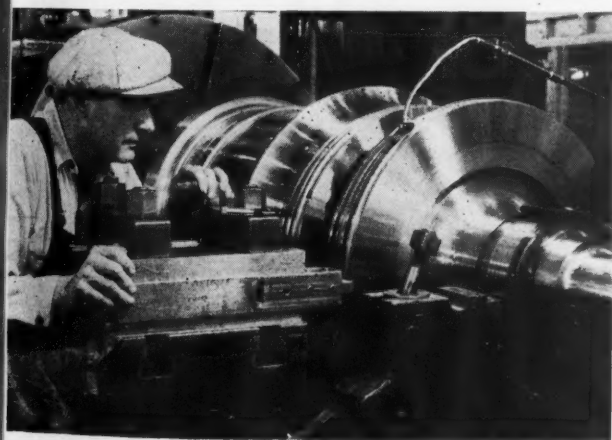
Instead of using the conventional methods for cutting blade-ring grooves in the rotors of the low pressure cylinders for the 8,500 h. p. C-3 steam turbines, Hendy reverses the direction of the lathe spindle and sets the cutting tools upside down as shown in Fig. 19. This method has several advantages; it makes the cut immediately visible to the operator, it tends to eliminate chatter and to steady the work, it frees the tool from the weight of the spindle

and prevents "digging in," and it allows the chips to fall away instead of piling up above the tool in position to damage the work.

The 14 grooves to be cut vary in depth from  $\frac{3}{4}$  inch to 2 inches and



Fig. 19 — To Cut Blade-Ring Grooves, the Tools are Set Upside Down and the Lathe Spindle is Operated in Reverse Direction



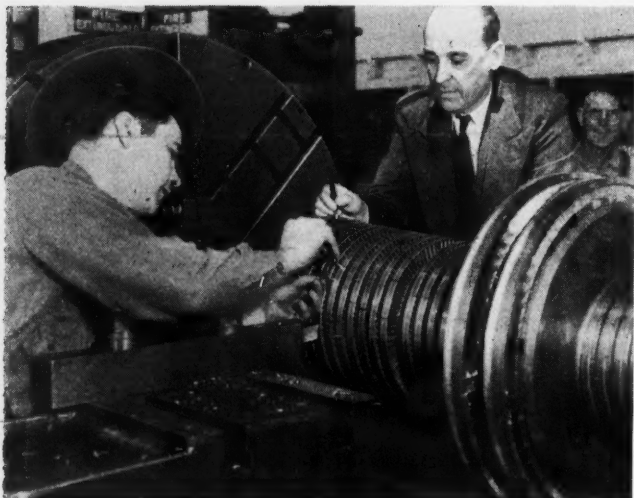


Fig. 20 — Machining Shroud Strips on High Pressure Turbine Spindle to the Correct Width. Extreme Accuracy is Necessary so that Steam may be Conserved

in width from 0.289 inch to 0.876 inch, with varying widths of undercuts. High speed steel is used for the tools used to cut the straight groove, step groove and undercut. The undercuts are both roughed and finished, but for the straight and steep cuts, use of finishing tools alone has proved highly successful in obtaining accuracy and finish.

Due to the high speeds at which the spindles for the steam turbines rotate, it is necessary that every spindle be in perfect balance before it is assembled to its engine.

The balance is tested by running the spindle at operating speed while it is supported in two floating bearings that are set on knife edges in the bearing columns. In principle, the balancing machine consists of a motor, a set of reduction gears, a shaft, the two floating bearings, arms leading from the bearings to pickup coils in which impulses are set up by the movement of the arms, and specialized electronic devices which record, segregate, and analyze the impulses as a basis for computations by which corrections will be made.

The balancing process is usually begun by adding a known unbal-

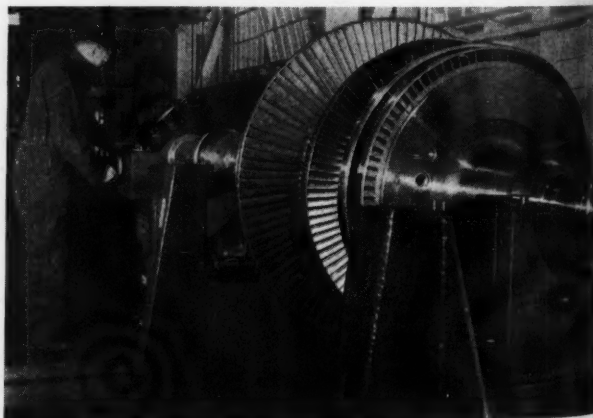


Fig. 21 — Testing a Spindle for an 8,500 H. P. Steam Turbine for Balance. This Machine Locates the Exact Point of Unbalance

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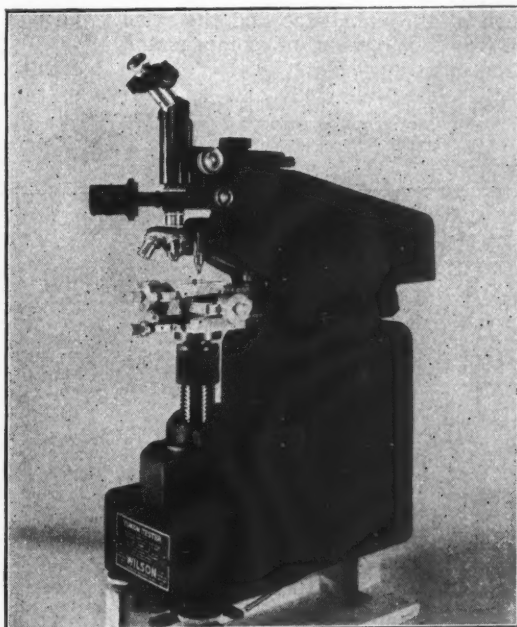
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## WILSON

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October, 1944

MODERN MACHINE SHOP 121

ancing weight to the component to be balanced—say three ounces—and setting dials and scales against this known figure, which provides an index for subsequent checking of the unweighted piece. The electronic devices, reacting to the impulses of the pickup coils, report the exact location of the unbalance and the result of the application of compensatory treatment.

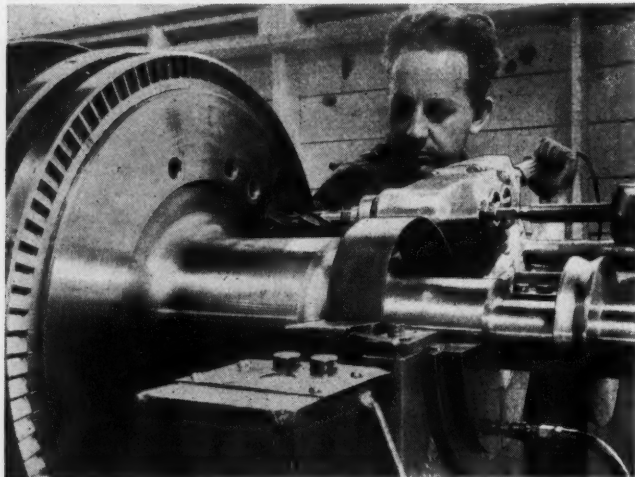


Fig. 22—The Exact Amount of Metal that should Be Removed to Balance the Shaft is Removed by Drilling with the Equipment Shown Here

Frequent checking of the dimensions of the shroud strip on a high pressure spindle for a C-3 turbine, as shown in Fig. 20, is a part of the process of facing the shroud strips to specified widths so that the proper clearance can be guaranteed as they revolve at close to 6,000 r. p. m. between the fixed blade rings in the cylinder casing. Extreme accuracy is essential since clearances are kept very small in order that all possible steam energy may be utilized. This is one of the final processes before the balancing of the spindle.

In the illustration Fig. 21 a low pressure spindle for an 8,500 h. p. C-3 steam turbine is shown undergoing a balancing test in one of the three dynamic balancers in the Henry machine shop. This machine has a capacity of from 2 to 12½ tons; the other two handle work of from 150 pounds to 1½ tons and from 0 to 1,000 pounds. The smallest one is so sensitive that it picks up unbalances

of as little as 0.000025 ounces, though most of the balancing averages to 0.1 ounce.

After the degree of unbalance in a part has been computed on a dynamic balancing machine of this type, and the location of the point of unbalance has accurately been determined, the balancing process is in a basis of right and left-hand planes. A drill is used, as shown in Fig. 22, to remove

the exact amount of metal required from the right plane of the spindle along a previously-indicated correction line, and the balance is then further corrected on a similar line on the left-hand plane surface of the spindle, the process being continued until a dead balance down to 1/100 or better is obtained.

In the case of large gears, unbalance is compensated by adding carefully-calculated amounts of metal plate to the inside of the fabricated wheel. Rotors are meticulously balanced when blading starts, but the

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Fig. 23—Stand for Testing Turbo-Generator Sets. Eight Sets may be Tested Simultaneously on this Stand

addition of the multiple rows of blades with spacers, locking devices, and shroud strips, plus the riveting of the shrouds, inescapably sets up variations in balance which must be adjusted, despite the exacting care which has gone into the machining of all the parts.

All rotors and gears (with the exception of the 147-inch C-3 turbine bull gears) are balanced on these machines. In the case of rotating parts for the 300-kw turbo-generator sets, the individual basket wheels of the spindle are statically balanced, but when the spindle is assembled on its shaft and joined with the pinion-gear spindle (which has already been dynamically balanced), the whole assembly is placed on the machine for final balancing.

Testing of the spindles and larger gears is usually done at a speed of 300 r. p. m. instead of at the known critical speed. Since the same elements of flutter or vibration are present at 300 r. p. m. as at the critical

speed (say 5,000 r. p. m.), the same effect may be achieved at the lower speed by electronic amplification of the minute impulses. Smaller parts are tested at an average of 400 to 500 revolutions per minute.

Eight turbo-generator sets may be tested simultaneously on the test stand shown in Fig. 23, which also has facilities for the testing of large main-propulsion engines. Sets are run at full load with a special testing and checking of all safety devices, actual operating conditions being reproduced in every respect. The special boiler supplies steam at 440 pounds pressure and 750 degrees superheat. It can, however, produce pressure up to 1200 pounds. Hendy-built turbines are put through a regular sequence of operations and must prove themselves under conditions far more severe than those they can normally be expected to encounter in service. In consequence, Hendy has established an enviable reputation as a builder of dependable engines.



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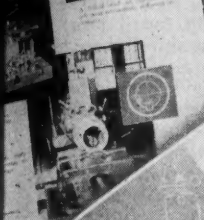
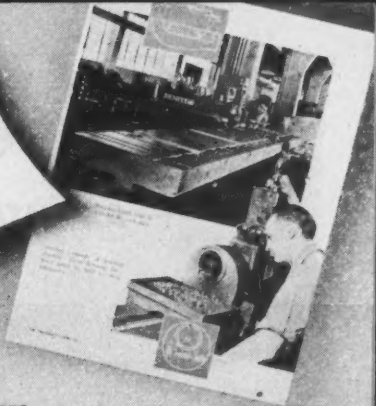
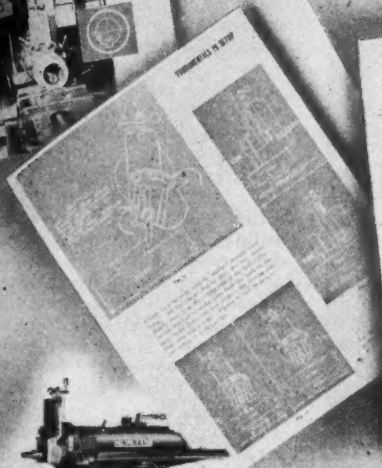
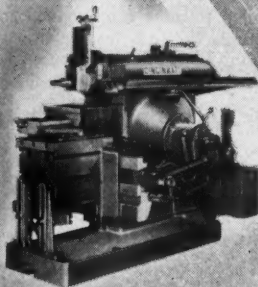


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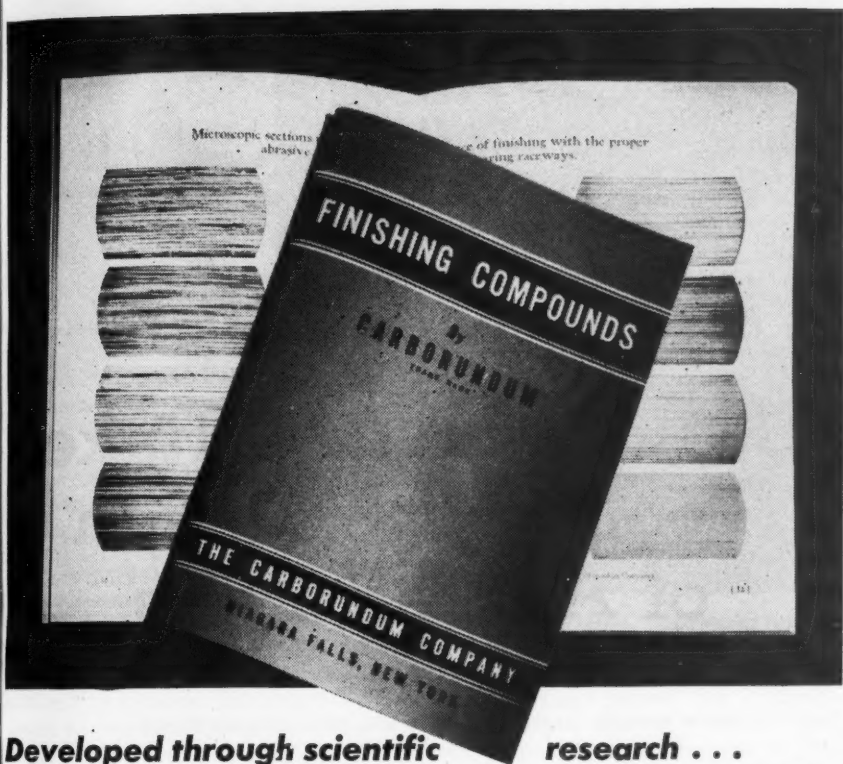
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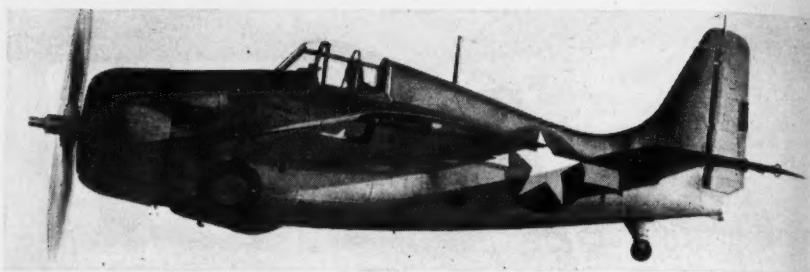


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 October, 1944  
 MODERN MACHINE SHOP 137



"Wilder Wildcat" Carrier-Based Navy Fighter Plane built only by Linden Division of General Motors Corporation

# Use of Negative Rake Tools in Production of Aircraft Parts

By J. Q. HOLMES\*

Master Mechanic, Eastern Aircraft Division, General Motors Corporation,  
Linden, New Jersey

**E**ASTERN Aircraft is one of General Motors' newest divisions. It was formed in January 1942 for the sole purpose of producing planes for the United States Navy. The personnel was recruited from many of the Corporation's other divisions. In all, 47 plants were called on for men. They came from plants from the Pacific to the Atlantic Coasts. These men had no aircraft experience prior to the start of this project. However, they were experienced in manufacturing problems. With these men for a start, people were hired and the personnel built up.

The Linden Plant, with which the speaker is connected, builds the

"Wilder Wildcat"—or FM-2—as it is designated. This is a carrier-based folding-wing fighter plane produced exclusively by General Motors. The Wildcat is built completely by Eastern Aircraft with the exception of government-furnished parts such as engine, guns, radio and so on.

Because of the high stresses in this product almost all structural parts that require higher physical strength than can be obtained with Aluminum Alloys are made from Chrome Molybdenum Steel such as 4130-4140 and Chrome, Nickel, Moly Steel such as 4340. These parts are machined in three conditions; namely, annealed, normalized and heat-treated.

\* Read at semi-annual meeting of A.S.M.E., Pittsburgh, Pa., June 20, 1944.

Inspection of Finish-Ground Cutters. Teeth are Held to Uniform Length Relative to the Mounting within 0.0003 to 0.0005 inch

The annealed runs

100,000

17 C Rockwell

The normalized runs

120,000 PST

24 C Rockwell

The heat-treated runs

180,000

40 C Rockwell

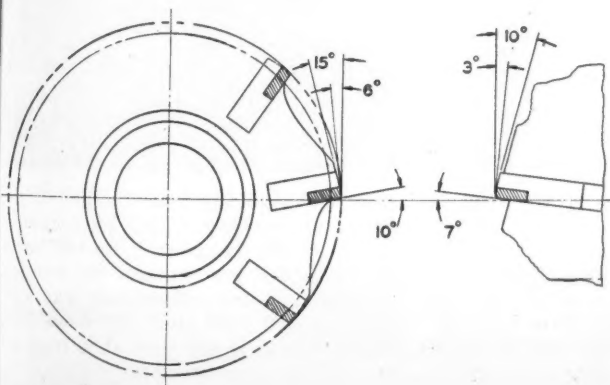
This discussion basically deals with the machining of those steels. The condition in which the pieces are machined is determined by the use, the limits to be held and the amount of warpage that develops as a result of heat-treating.

Negative rake cutting was investigated late in the year 1942. One of the manufacturers of tungsten carbide told us of the performance of such tools and left us a circular describing the method. Of course, our first reaction was typical: "We knew

it couldn't be done." However, one of the first things we were told in airplane work was that "one didn't have to be crazy to build planes, but it surely helped," and having learned that many new ideas would work, we decided to order a milling cutter of the negative-rake type.

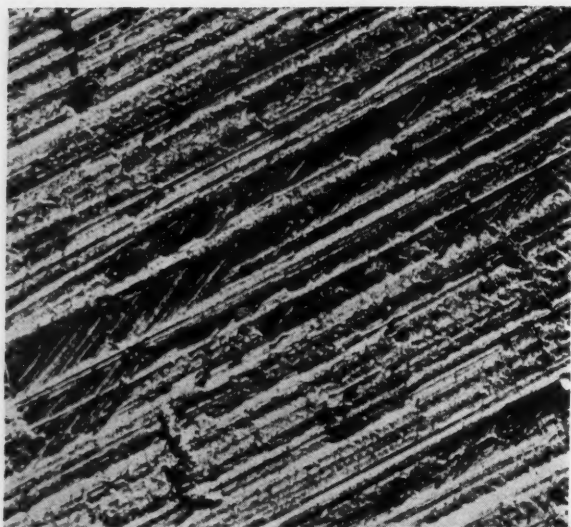
Following the recommendation of the carbide manufacturer we ordered

one 6-inch diameter inserted blade face mill with negative helix and negative rake. The cutter manufacturer at once "knew" we were screwy and



Drawing of Typical Grind Used on Negative Rake Milling Cutters. A Print of this Drawing is Posted in the Grinding Room for the Guidance of Operators





(Above)—Micro-Photo of the Finish Obtained by Conventional Milling on 4130 Steel, X10

advised us they could make us such a cutter "if we wanted it," but politely questioned its design stated that, if made, no such cutter would be guaranteed. We assured them that we did want this cutter and would not hold them responsible for its performance.

When the cutter came in, the representative of the carbide manufacturing company came in to see it tested. The test was run on a No. 5 Milwaukee Vertical Mill, which was selected because it was one of our heavier machines. At his recommendation, cutter speed was set high but the feed per minute was only a

little over previous cuts. Since this meant little increase in production we started to increase feeds as the speed went up, holding the chip to a thickness of about 0.002 inch per tooth per revolution.

All this time the chips came off like a snow storm, but red hot—so hot that the wood block

(Below) — Finish Obtained with Negative Rake Tools on 4130 Steel, X10



floor was smoking from the hot chips. When we reached a then phenomenal speed of 1000 feet per minute and feed of 21 inches per minute, we decided to call it a day. This test was run on annealed 4130 steel which we had been milling every day at a feed of 1½ inches per minute.



# 3

**JOBS WELL DONE** *on the*

## ILLINOIS DIE FILING MACHINE

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### 1-FILING

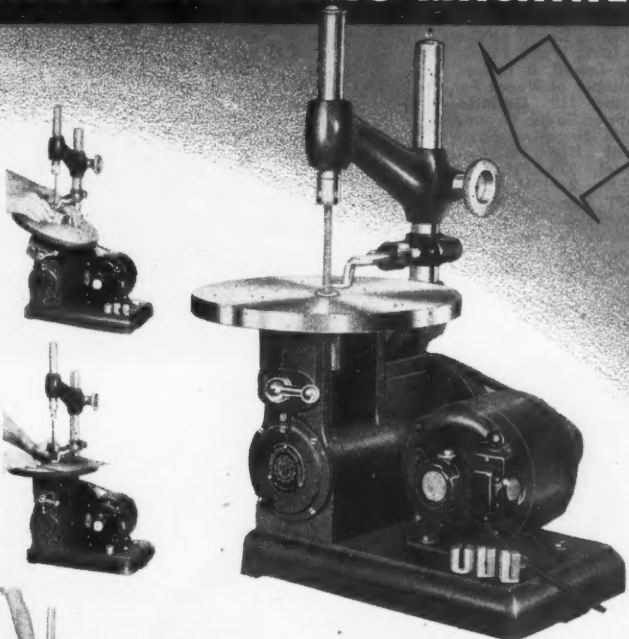
Designed for filing of intricate die shapes...table can be tilted to right or left up to 30° from horizontal. Hand die can be used.

### 2-SAWING

The table has a removable ring insert so that slots of 1/8" and 1/4" can be cut up to 12" long. Recommended, low speed for cutting of 6 hole punch holes.

### 3-DRAWING

A drawing plate can be tilted and easily and quickly which emphasizes the value of the versatile machine for performing the most intricate drawing plate work, drawing and drawing.



### RAPID AND ACCURATE PERFORMANCE OF CRITICAL FINISHING OPERATIONS

PRECISION and BALANCE mark the Illinois Die Filing Machine which is designed to save time and do a superior job on finishing intricate die shapes. Convenient and adaptable, it is built with extreme precision and durability. Working parts are hardened and ground for accuracy and long life. Automatic forced feed lubrication reduces wear to a minimum. The Illinois Die Filing Machine relieves tedious hand filing of intricate shapes and assures greater accuracy at lower cost.

Write for descriptive literature, today!

Overnight to All America... From the Hub of Air Transportation.



**ILLINOIS** PRECISION METAL CUTTING TOOLS

Shaper Cutters

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Milling Cutters

Ground Form Tools

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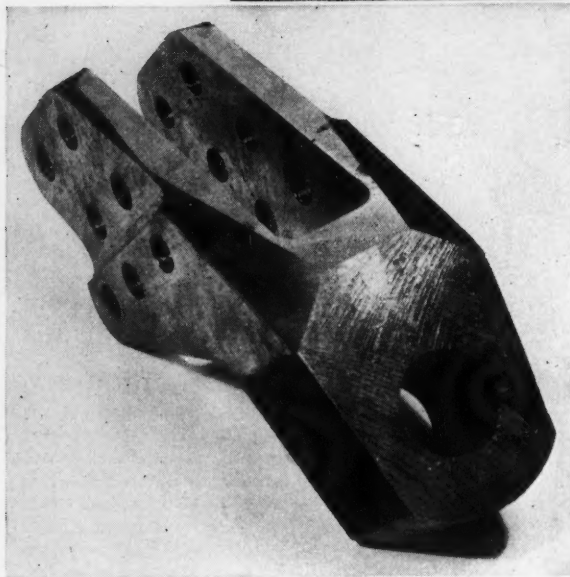
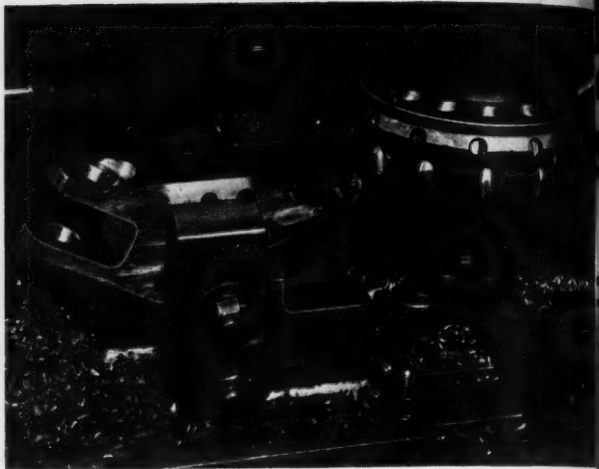
Special Tools - Gear Measuring Machines - Gear Measuring Blocks

## ILLINOIS TOOL WORKS

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In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario.

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

**Set-Up for Machining a Wing Hinge Fitting.**  
 Material, 4130 Steel;  
 Tensile Strength, 105,000 PSI. Run on a No. 5 Vertical Mill; Speed, 400 RPM; 838 SFPM; Feed 21 IPM; CPT 0.00375; Depth of Cut  $\frac{1}{8}$  Inch; Width 3 inches; Length 5 inches. Number of Pieces Per Grind, 119. Carbide-Tipped Tools, Ground with Negative Rake. With High Speed Steel, 37 RPM; 77.5 FPM; 2 IPM; 0.004 CPT. Same Depth and Width of Cut, 97 Pieces Per Grind. HP Required, 13.4 at 21 Inch Per Minute Feed



Photograph of Finished Wing Hinge Shown in Work in the illustration above. Note that Surface Around Hole is Cut with High Speed Steel Producing Conventional Finish. Speed 12 RPM; 41 SFPM; 7/16 IPM; 0.0014 CPT. Soluble Oil Used. Surfaces Adjacent to Slot Were Machine with Negative Rake Cutter Using No Coolant. Speed 326 RPM; 1024 SFPM; 54 IPM; 0.0007 CPT; Depth of Cut  $4\frac{1}{2}$  Inches; Width 11 Inch; Length of Cut 4 Inches

The results of this test proved to us that we really had "something;" what, we didn't know. It was decided to use this cutter and find out if this was an application of a really usable tool. Weeks of test continued. Different grinds were tried; tips were broken and replaced, proving one

thing — inserted blade cutters were desirable. While this test work was taking place, economic problems arose. Machinery was scarce and delivery of new machines slow. Our production schedules were increasing. The Navy wanted more—always more. Man power was scarce too, and often when a man had been trained to a point where he was producing, we would lose him to the draft.

All these problems proved to

# 32 SPINDLE SPEEDS

**...with only  
2 Control Levers and  
1 Back Gear Lever**

Operators are enthusiastic in their praise of this new direct reading speed control. They don't have to refer to index plates or retain lever positions in their minds when making speed changes. Its superiority and convenience encourages operators to use correct speeds for their work. Being direct reading, operators are not fearful of making mistakes.

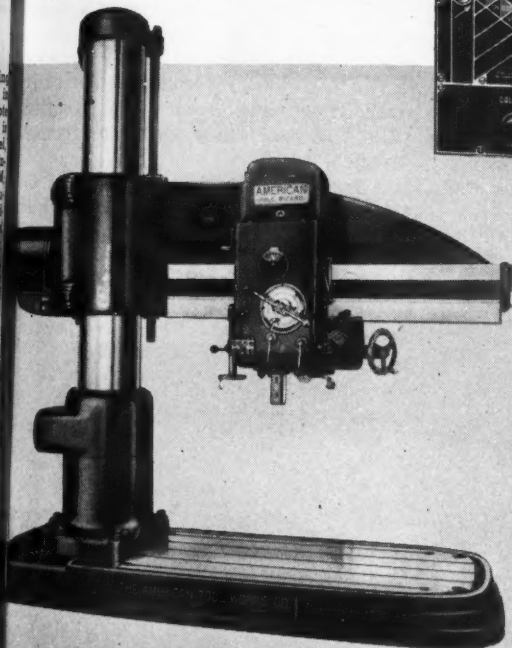
The entire range of 32 spindle speeds is secured through two opposed vertically operated



levers which are direct reading and one two-position back gear lever used only when changing from the high to the low speed range or vice versa.

This new speed control makes work easier; increases production because of it and the payroll dollar buys more as a consequence.

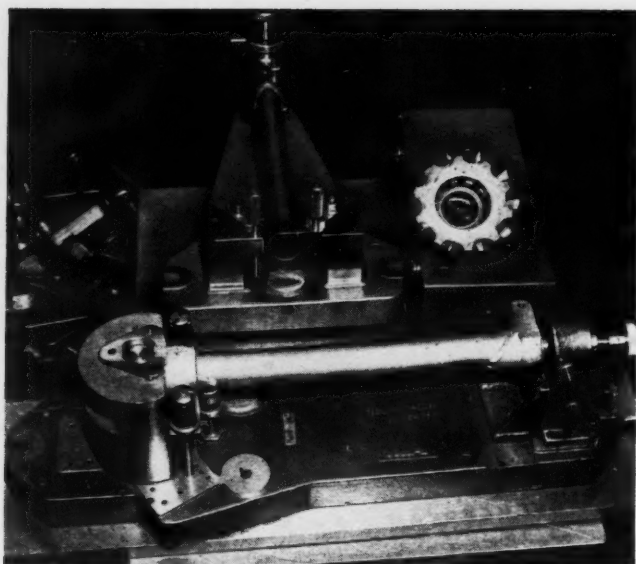
This and other fine features of the "American" Hole Wizard Radial Drill are thoroughly illustrated and described by Bulletin No. 326.



**THE AMERICAN TOOL WORKS CO.**

Cincinnati, Ohio, U. S. A.

*Lathes and Radial Drills*



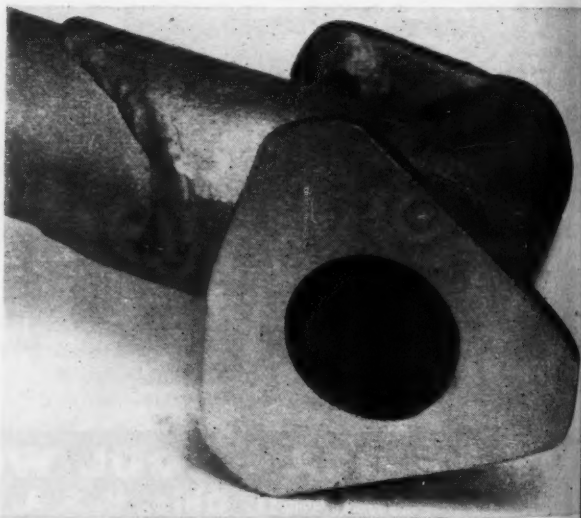
Fixtures and Cutters Used for Machining Landing Gear Struts. Material, 4130 Steel. Tensile Strength, 100,000 PSI; Operation, Face Milling; Two Surfaces Shown. Negative Rake Carbide Tipped Cutter; Speed, 400 RPM; 833 SFPM; Feed 21 IPM; 0.0025 CPT. Depth of Cut, 3/32 inch; Width of Length 3 x 3 inches. 158 Pieces Per Gear. This Operation Required 4 HP with Sharp Cutter and 1 HP with Dull Cutter.

that if parts could be run in production at the speeds found satisfactory in tests, we could produce more on our existing machines and tools and use less man power.

Our tests had shown us another desirable improvement — Finish! While we do not need the finish required in aircraft engine work, a good machined

finish is desirable. Our tests showed that with negative rake tool finishes were much superior

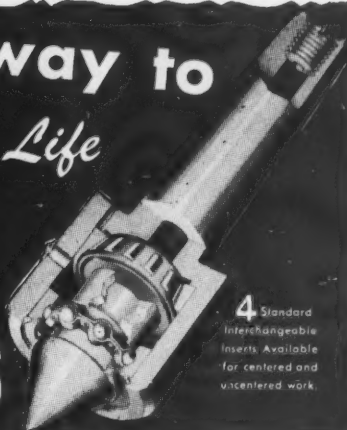
over those produced with positive rake. In fact; they look like ground finishes. All of these findings convinced us that we should put this new method into production. Please keep in mind



Close-Up Showing Milled Surfaces of One End of Part Shown in Previous Illustration. This Part was Designed for Heavy Stress, Being an Assembly of a Chrome-Moly Forging and a Piece of Tubing Welded Together and Heat Treated. The Milled Surface is Held to 0.0015 inch with Respect to the Milled Surface on the Opposite End.

Pointing the way to  
*Longer Tool Life*

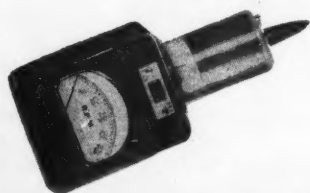
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4 Standard  
Interchangeable  
Inserts Available  
for centered and  
vicercentered work.

Increase Tool Life—Handle heavier loads—permit deeper cuts at higher speeds because they rotate with the work. Built for precision jobs. Where standard inserts cannot be used, special inserts may be made to suit the requirement. Centers with Morse tapers carried in stock.

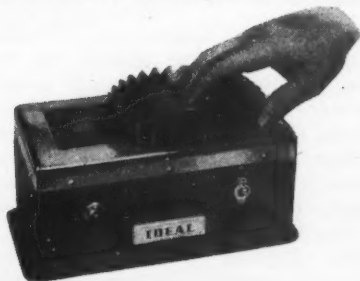
## ELECTRIC TACHOMETER



Effective for checking all machine and tool speeds. Equipped with a wheel for measuring surface speed in feet per minute. "Hand" Type and "Separable" Type. Two Ranges—0 to 2500 RPM and 0 to 5000 RPM.

## DEMAGNETIZER

A single pass across the Demagnetizer removes metallic dust, flakes, fine chips, etc. Keeps Tools Sharp Longer. Powerful—Portable. Two sizes.



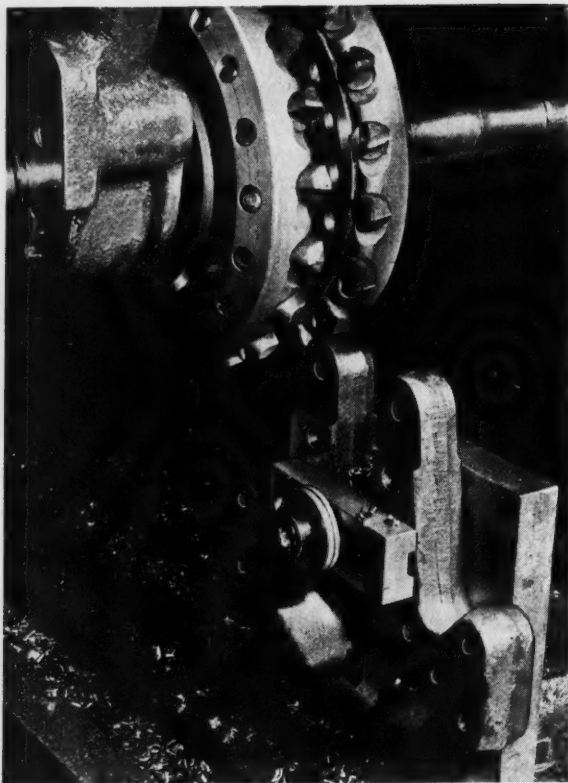
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★ IDEAL COMMUTATOR DRESSER CO. ★

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SYCAMORE, ILL.

Sales offices in all principal cities. In Canada: Irving Smith Ltd., Montreal Quebec.



Close-Up of Straddle Milling Operation on a Lock Fitting that Holds the Folding Wing in Position. This Part is Extremely Important. Material, 4140 Steel; Tensile Strength, 105000 PSI. Fixture Shown was Too Light for Job; Fixture has Since Been Rebuilt. Cutter, Carbide Tipped, Negative Rake. Speed, 247 RPM; 623 SFPM; 15 IPM; 0.0031 CPT; Depth of Cut  $\frac{1}{8}$  Inch; Width  $1\frac{1}{4}$  Inch; Length  $1\frac{1}{2}$  Inch. Pieces Per Grind, 100

that our sole reason for existence was to build more planes for the Navy and build them always better. We were not interested in the development of a new method, either from a sales angle or from a problem in research or engineering. Just one thing—to get the “most of the best for the least.”

The adoption of such a program met with considerable resistance. Our people thought that such speeds were merely stunts. At first our operators were afraid, due to the large quantity of hot chips that flew from the work. The use of Safety Goggles was required. Speeds and feeds would be maintained while the Tool Engineer was present, but as soon as he left,

the feed would be reduced.

We now have about thirty jobs running with negative rake tools, including milling, turret lathe and precision boring work, some of which will be shown a little later in this discussion.

The milling operations are face milling, straddle milling and slotting of steel. To date no tests have been run on slab mills, the reason for this being that the cutters are

quite difficult to tip with carbide. All of these milling jobs have shown remarkable increases in production. Feeds have been increased from a range of  $\frac{1}{16}$ :2 to  $5\frac{1}{2}$ :30 inches per minute. Ratio of decrease in cutting time is 10:15 to one. In fact, cutting time has been reduced to such a point that it is but a small part of the total time required on an operation.

To really take maximum advantage of this cutting speed, automatic loading or indexing fixtures should be built. We have not gone into this as aircraft production does not justify such tool expense. However, the information gained will be of great value in automotive tooling.

The turret lathe jobs are turning



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# SPEED — PRECISION ECONOMY

... PLUS HYDRAULIC  
VERSATILITY FOR QUICK  
CHANGE-OVER TO NEW PRODUCTS



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tween centers 30".

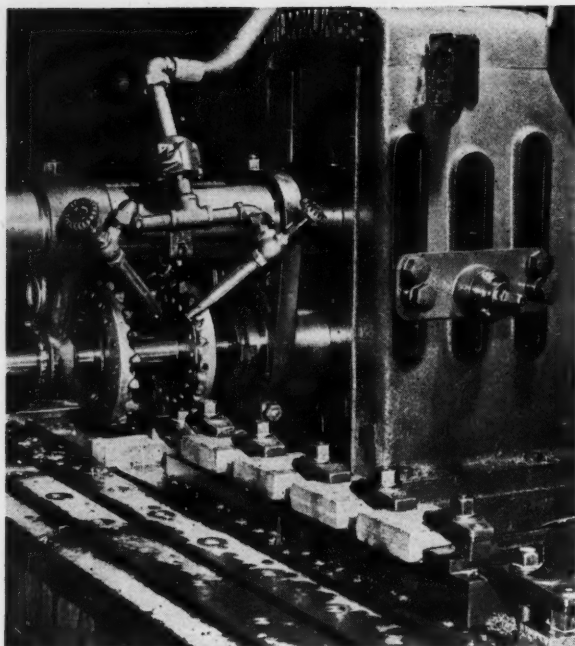
Designed especially for carbide tools, the Lipe Carbide-Matic Lathe gives you full advantage of modern "man-made diamond" cutting tools. It has the rigidity and brute power for fast, heavy hogging or intermittent cuts on high brinell steels . . . the high spindle speeds for efficient precision finishing to tolerances as close as .0005" . . . and the automatic "know how" which carries a cycle to completion without help from the operator. Labor costs, tool costs and scrap costs are lower. Adjustment, cleaning and re-setting are simpler.

It has the versatility for quick change-over to new products or parts. Feed rates, traverse rates and sequence of motions are hydraulically controlled, permitting almost infinite variation. Speed changes range through 198 different steps from a low of 59 to a high of 3,100. It is a lathe you can rely on . . . a lathe that will give you the very qualities you'll need most in a post-war world of change, obsolescence and new products.



## LIPE - ROLLWAY CORPORATION

SYRACUSE 1, N. Y.



**Straddle Milling Operation on Wing Reinforcement Angle, Using Negative Rake Cutters. Speed, 200 RPM; 477 SFPM; Feed 20 IPM; 0.0055 CPT; Depth of Cut,  $\frac{1}{8}$  Inch; Width  $1\frac{1}{4}$  Inch; Length 4 $\frac{1}{2}$  Inch. Pieces per Grind, 141. Note that This Machine is Running at Much Lower Speed than Other Operations Described, which is Due to Fact that 200 RPM is Maximum Speed Obtainable with Present Gears. New Gears Have Been Ordered. Flat Surfaces on These Parts were Machined on a No. 5 Vertical Mill, Using a Negative Rake Cutter at 400 RPM; 838 SFPM; Feed 25 IPM; 0.0045 CPT; Depth of Cut  $\frac{1}{8}$  Inch; Width 4 Inches; Length 4 $\frac{1}{2}$  Inches. Number of Pieces per Grind, 149. 138-Pound Flywheel Was Used on Spindle. This was the Only Job Run with a Coolant When Using Negative Rake Tools, Coolant Being Desirable on this Set-up Because of the Slow Speed**

and facing. As shown in the illustrations, these jobs often involve intermittent cuts. Cutting time has been reduced, however, since these jobs are running two to four times faster with feed increases of two to three times. Speeds of 400-500 SFM are used with feeds of 0.009 inch per minute compared with 0.003 inch. Several parts that were previously ground are now bored on Heald Bore-

matics. Many of these parts are about 40 Rockwell "C."

The grinding of tungsten carbide tools for this work must be done carefully. We have found by test that the best angles for our work are 7 deg. negative helix and 10 deg. negative rake, on face mills, and all our milling cutters are ground to these angles. It is imperative that these cutters be finish-ground with

## ... for more than 1001 odd jobs



**HJORTH LATHE & TOOL CO.**

The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeals to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

**WRITE TODAY FOR DATA AND PRICES.**

**12 BEACON ST., WOBURN, MASS.**

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**WITH** Rotary Files, the world's foremost file manufacturer now extends still further the scope of the well-known Nicholson slogan, "*A file for every purpose.*"

After thorough study of the fast-growing uses of Rotary Files, Nicholson is prepared to provide both *Hand Cut* and *Ground-from-solid* types.

*Each type is available in 16 standard styles or shapes; 3 cuts (Coarse, Medium and Fine); 64 sizes and in diameters 1/8" to 2".*

For easy identification, each file shank

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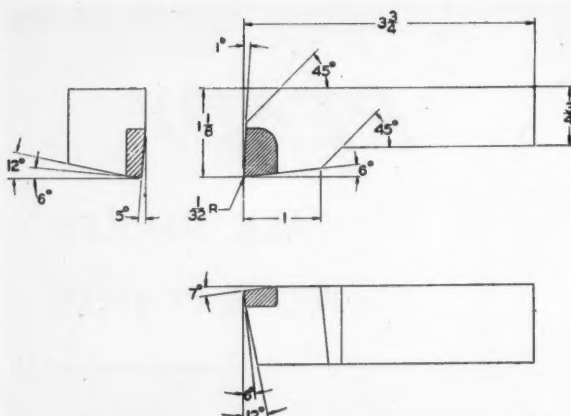
Nicholson Rotary Files are manufactured from high-speed steel. Carefully shaped and true centered. Accurately cut or ground. Expertly hardened. . . . In every respect, upholding the Nicholson tradition for *The right file for the job* in the highest quality obtainable.

**\*SEND FOR CATALOG AND PRICE LIST.** Write us for any special information. For deliveries, consult your mill-supply house.

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(Also Canadian Plant, Port Hope, Ont.)

**NICHOLSON FILES**  
**FOR EVERY PURPOSE**





Drawing Showing Typical Grind for Carbide Tipped Facing Tool of the Type Used on Turret Lathes. Note Negative Side Rake and Negative Back Rake

diamond impregnated wheels. If Silicon Carbide is used, the wheel breaks down before the cutter is finished, and the teeth are of unequal length. With diamond wheels the teeth are held to the same length within 0.0003 to 0.0005 inch. After grinding, cutters are inspected to see that this

dimension is held. Spindles must run true and the cutters must be checked for run-out after mounting on the machines. While the same problem is not encountered with lathe

tools, we rough-grind with Silicon Carbide wheels and finish with diamond wheels of 180 grit. The grades of carbide used play an important part in the performance of the tools. We have used two grades, one for milling and turning, and another for facing when intermittent

## Center Scope Accuracy Solves Locating Problems!






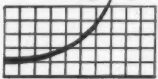

It was used in making the initial setup of this job on a die sinking machine.

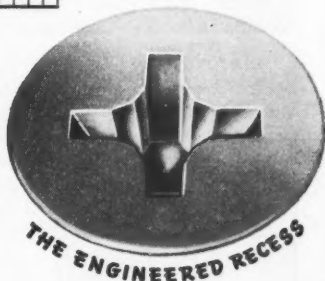
During the machining operations, the Center Scope was again used to check dimensions that were inaccessible to mechanical measuring instruments.

This illustration is but one of many examples of the use of the Center Scope in locating and measuring to a .0001" accuracy.

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WHEN THIS  DREW A BLANK  
 THE BOSS TORE HIS HAIR   
 UNTIL SOMEONE WISED HIM UP TO  
 THIS  → THE RECESSED HEAD  
 SCREW THAT UPS  DRIVING-  
 SPEED AS MUCH AS  
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 IT'S PHILLIPS



Symied because you've just got to boost assembly department output and you can't hire more workers to do it? No need to be!

You can boost output another way - by switching to Phillips Recessed Head Screws. They will increase driving speed as much as 50 percent. They have done it for hundreds of plants!

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 The Hoffman Screw & Mfg. Co., Cleveland, Ohio  
 New England Screw Co., Macon, N. H.  
 Parker-Kalon Corp., New York, N. Y.

Pennsylvania Screw Co., Pottsville, E. L.  
 Phoenix Manufacturing Co., Chicago, Ill.  
 Reading Screw Co., Harrisburg, Pa.  
 Russell Burdett & Ward Bilt & Mfg. Co., Port Chester, N. Y.  
 Savell Manufacturing Co., Waterville, Conn.  
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**Faster Startings:** Driver point automatically centers in the Phillips Recess... fits snugly. Fumbling, wobbling starts, slant driving are eliminated. Work is made trouble-proof for green hands.

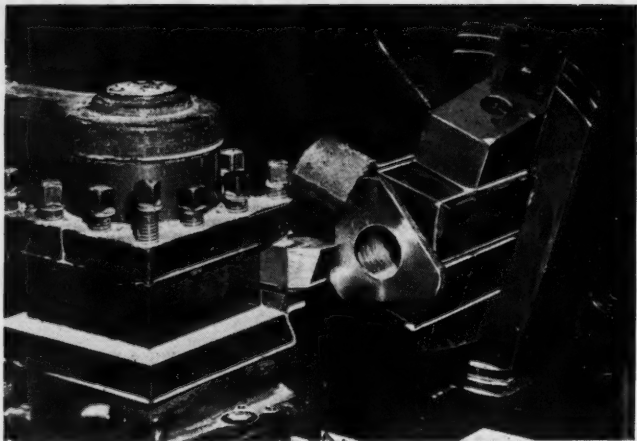
**Faster Driving:** Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

**Easier Driving:** Turning power is fully utilized. Workers maintain speed without tiring.

**Better Fastenings:** Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.







Turret Lathe Set-up for Machining Fitting Used on One End of Landing Gear Strut. Cutting Compound is Used on all Lathe Operations on Which Negative Rake Tools are Used. Material, 4130 Steel in Normalized Condition. Work Speed, 45 RPM; 356 SFPM; Feed, 0.003 IPR; Depth of Cut 1/4 Inch; Number of Pieces Per Grind 10.

cuts are made. Several makes have been tried and while we feel that there is a big field for tests on cutting grades, we are not doing much with it as we are getting excellent results from these two grades.

Much has been written on the subject of tooth lead and number of teeth. Our work has been done with chip under 0.005 inch per tooth per revolution. At first, our speeds were higher than at present up to 1285 FPM with chip of 0.002 inch. Now we are running speeds from 800 to 1000 FPM and chip thickness up to

## DESMOND GRINDING WHEEL DRESSERS



Desmond Hex Dresser



Desmond Heavy-Duty Dresser



Desmond Huntington Dressers

Our Desmond Huntington Cutters are made in all sizes.



We manufacture only complete line of dressers and cutters on the market, and will be glad to send samples for trial. Write for copy of our new catalog and name of your nearest jobber.



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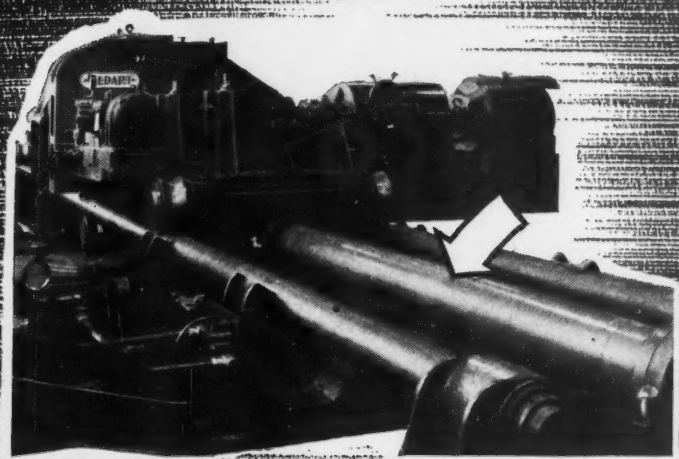
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or, 1944



## Hydraulic Power for big jobs

This Medart Billet Peeler, capable of peeling or scalping round steel billets in sizes up to 13 in. diameter, uses powerful, easily controlled hydraulic action for clamping the billet in the carriage, and for advancing the carriage as the billet goes through the rotating cutter head. Hannifin precision hydraulic cylinders are used by Medart for both these applications.

The carriage cylinders are an example of Hannifin ability to build large, long stroke hydraulic cylinders to precision standards. These cylinders are 11 inch bore x 144 inch stroke.

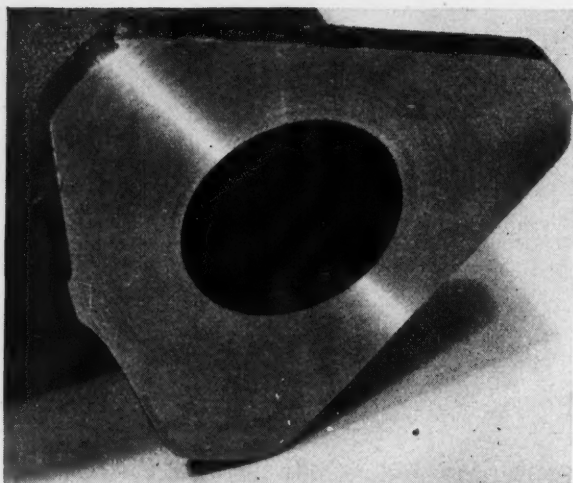


Just as in the smaller sizes, these cylinders are bored and honed to produce a mirror finish cylinder body—for maximum power, smooth action, and long life.

Bulletin 35 describes Hannifin hydraulic cylinders. Write for your copy. Hannifin Manufacturing Company, 621-631 South Kolmar Avenue, Chicago 24, Illinois.

**Hannifin**

**HYDRAULIC CYLINDERS...**



Close-Up View of Finished Piece Shown in Operation in Previous Illustration

let me emphasize that we are getting excellent results — which are what we want!

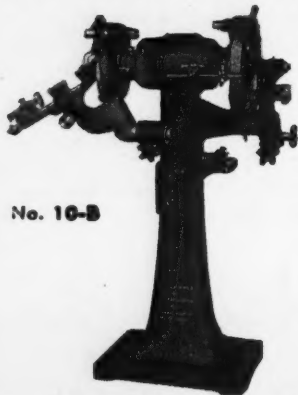
In the examples to follow, comparison is made between carbide tipped milling cutters with negative rake and high speed steel with positive rake. You may ask what is the comparison between negative rake and positive rake cutters with the

0.0045 on milling. Most of our mill cutters are 6 inch diameter with 10 teeth or 8 inch diameter with 14 teeth. These have more teeth than many people think proper. Again

same grade of carbide? We have never made that comparison because we never have been successful in the use of carbide milling cutters with positive rake on steel.

## GRAND RAPIDS

Combination  
**Tap and Drill Grinder**  
**MOTOR DRIVEN**



No. 10-B

**SHARPENS TAPS No. 6 to 1½"**  
2-3-4 Flute, Right or Left Hand.

**SHARPENS DRILLS ½" to 1½"**  
2 or 3 Flute, Straight or Taper Shank.

Other Combinations also available.

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336 Straight Ave., S. W. • Grand Rapids 4, Mich.

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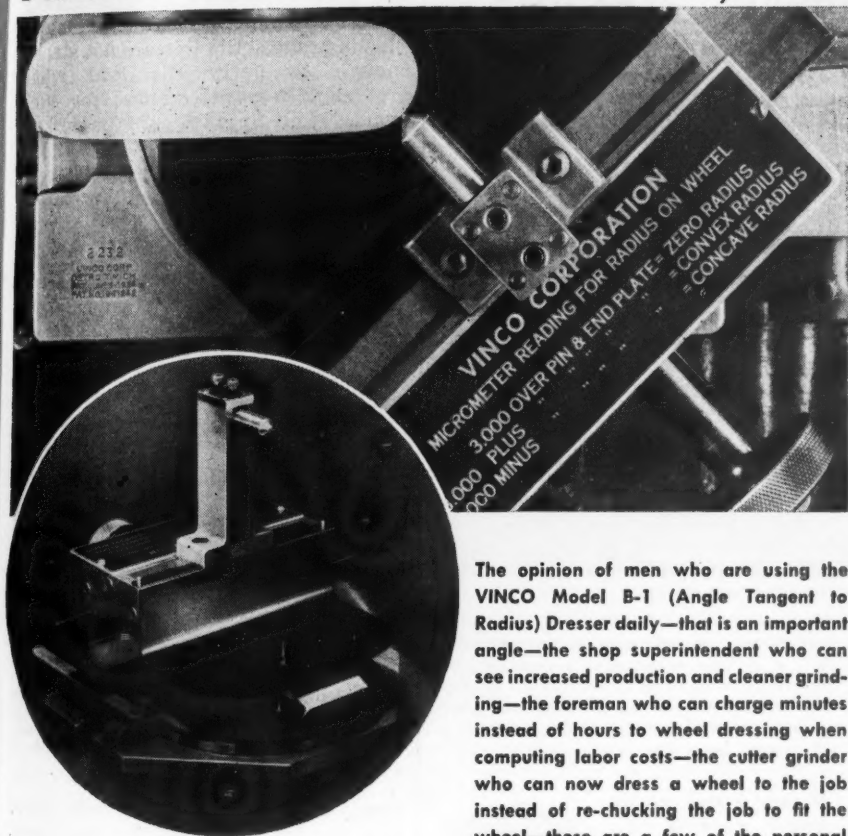
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# THERE ARE OTHER ANGLES, TOO



The opinion of men who are using the VINCO Model B-1 (Angle Tangent to Radius) Dresser daily—that is an important angle—the shop superintendent who can see increased production and cleaner grinding—the foreman who can charge minutes instead of hours to wheel dressing when computing labor costs—the cutter grinder who can now dress a wheel to the job instead of re-chucking the job to fit the wheel—these are a few of the personal angles that are largely responsible for the rapid increase in the VINCO B-1 Dresser acceptance. Write us direct or consult our District Sales Offices for any further information.

Sub bases will be furnished (at slight additional cost) for most types of external and internal grinders. When ordering, specify the machine or machines on which the dresser will be used. This will enable us to advise you correctly on the type of base best suited to your specific needs.

**VINCO CORPORATION, 8861 SCHAEFER HIGHWAY, DETROIT 27, MICH.**  
SALES OFFICES— NEW YORK CLEVELAND CHICAGO

**MILLIONTHS OF AN INCH FOR SALE BY VINCO**

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*in the Groove*



*With a*  
**MARQUETTE A.C. ARC WELDER**

Literally or figuratively... that expression applies perfectly to Marquette Welders.

Literally... the secret lies in the way Marquette employs a.c. current for lower costs and better performance. Flawless welds are possible in deep angles and grooves because there is no "magnetic blow" to pull the arc out of line. Perfect arc control makes stronger, more uniform and better looking welds.

Figuratively... in the jargon of the "rug-cutter"... it's the sweet, smooth performance of these versatile machines, on any job of fabrication or repair, that puts you "in the groove" and gives you the fast, low cost, flawless welds for which Marquettes are noted.

**No other method equals electric welding for speed, quality and economy for tool and die fabrication.**

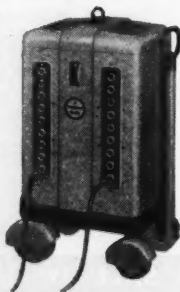
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MFG. CO., INC.  
Minneapolis 14,  
Minn.**

**MARQUETTE**

REGISTERED U.S. PAT. OFFICE

**A.C. ARC WELDERS**



The experience of the author and his associates over a period of years has been failure of carbide milling cutters with positive rake on steel. This is because the tips are not strong enough to carry the lead when ground with positive rake; for such grinds, High Speed Steel is more satisfactory.

Carbide has, of course, been used with positive rake in milling alu-

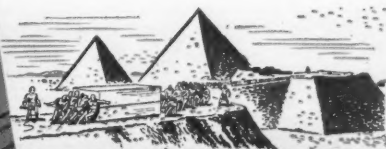


**Turret Lathe Set-Up for Machining Opposite End of Landing Gear Strut Shown in Previous Illustrations, Using Negative Rake Tool. Speed, 475 RPM; 356 SFPM; Feed 0.009 IPR; Depth of Cut, 1/4 Inch; Pieces Per Grind, 69.**

minum, and to date we do not know of a top limit of speed for this work. Our recent experiments on milling aluminum with negative rake indicate that it will be possible to use the same cutters for aluminum as for steel. The advantage of this is better finish and reduction of cutter inventory.

We have done some test work on chip loads up to 0.008 inch but find on our mills that the spindles are light for this load. We are using No. 3, No. 4 and No. 5 knee-type mills in most cases. An exception is a duplex mill on a straddle mill job.

# WHAT HAS THIS TO DO WITH BROACHING?



THE Alcan Highway, hurled through hitherto impenetrable forests, across mountains, rushing torrents and treacherous muskeg . . . all conquered by man and his machines . . . machines that owe, in great measure, their very existence to the elementary principle of the inclined plane. Used in ancient Egypt it enabled the engineers of the Pharaohs to move into position by sheer human effort the massive blocks of stone that formed the Pyramids. This same principle, upon development became the worm gear — that efficient instrument of power transmission — used in nearly every field of power application . . . without which our machine built civilization might well collapse.

EVEN as the principle of the inclined plane has influenced daily living in the widespread use of the worm gear, so also has Broaching, developed through successive phases from a crude beginning. Today, thousands of parts are made quicker, cheaper and better by modern applications of the broaching principle. In keeping with the trends of the past, even greater developments are in store for the world of tomorrow.



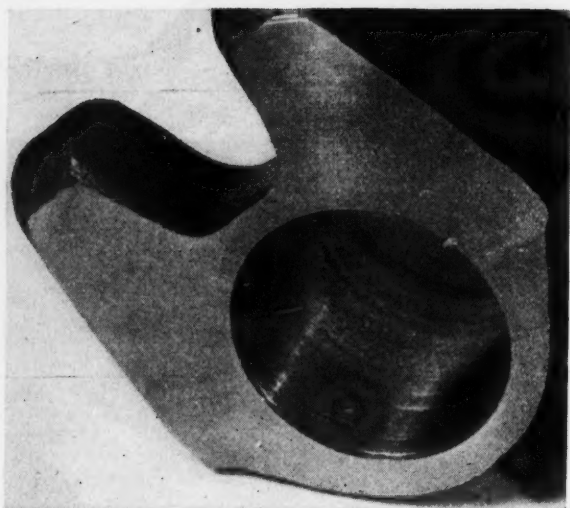
By driving steel balls, and later, crude drifts through the heated part . . . clever builders broached the hubs of the famed covered wagons.



*The* **LAPOINTE** Machine Tool Company

ROBTON, MASSACHUSETTS, U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES



Finished Part Shown in Work in Previous Illustration. Note Intermittent Cut

This machine has a top speed of 200 RPM, but even with this we have increased our feed to 20 inches per minute over a previous 1 to 2 inches.

We are testing fly wheels on the cutter end of the spindle to see if heavier cuts can be taken. We feel that with heavier machines much more can be done than we have done with our present machines.

Many people have asked about power requirements. As stated before, we are using negative rake tools for production, not research. However, we have installed meters on a No. 5 vertical 20 h. p. machine

and have taken power readings. A wide variety of parts were run on this machine and observations made of the power used. On the parts illustrated, the power consumption was of no consequence. Some of the readings are given in the captions to the photographs.

We found that a great deal of variation exists between dull and

sharp cutters. In many of the tests we found that a dull cutter required twice the horse power of a sharp cutter. On one of the tests a sharp cutter required 13.4 horse power motor, even this was not objectionable.

We feel that within the normal capacity of the machine, increase in power for negative rake milling is no problem. This is because with the greatly reduced cutting time, such load occurs for such a short period of time relative to the total time that the motor will carry the overload, if any, without any trouble.

# COMET

## INTERNAL THREADING AND BORING TOOLS

For holes from  $\frac{1}{8}$ " upwards, 15 different sizes. The accurate thread angle is maintained through each sharpening until tool is entirely worn down. Small head-long cutting surface for regrinding.

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The image displays four different types of Morse drill bits. On the left, there is a small, short drill bit with a double-flute design. Next to it is a standard double-flute twist drill. To its right is a more complex, multi-fluted twist drill. On the far right is a large, circular drill bit with many sharp, pointed teeth, resembling a gear or a reamer. The bits are arranged vertically against a dark background.

## KEEPING PACE With The WORKHEAD

with its increased efficiency -- is a job worth the best that any small tool line can deliver.

Morse Tools have kept pace with industrial development for generations... supplying the necessary qualities to maintain high production.

# MORSE

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## TWIST DRILL AND MACHINE COMPANY

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SAN FRANCISCO STORE: 1180 FOLSOM ST.



We have not had any trouble with our motors from heating or from over-load.

One interesting fact was found; namely, when we increased feeds as, for example, from 15 inches per min-

ute to 20 inches per minute on a given job, the increase in power consumed was negligible.

By this time negative rake tools have been accepted by both operators and foremen. They now are interested in seeing other jobs toolled, and are receptive to the method.

In some cases it has had the effect of stimulating operators to higher speeds on other operations. More jobs are being changed to negative rake tooling as fast as tools can be provided. In this plant negative rake tools are no longer experimental.

A fool and his money are soon parted. Be wise; buy Victory Bonds and have your money when you need it.

## HAMILTON SWISS TYPE GEAR HOBBERS



...for accuracy  
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PINIONS,  
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### TWO MODELS

No. 00 SPUR GEAR  
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No. 1 SPUR and  
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SEND US YOUR PRINTS FOR *Quotations*

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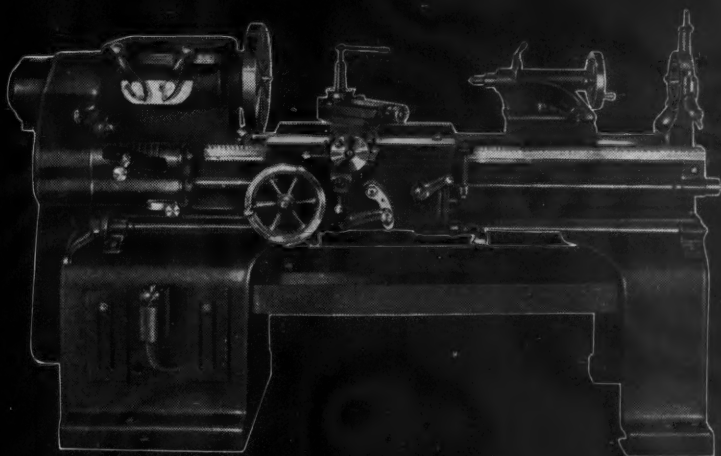
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Through fifty-seven years of specializing exclusively in lathe manufacturing the trade-wise have learned that the name SEBASTIAN means more value for their lathe-purchasing dollar.



*"Best Lathe In The  
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## QUESTION No. 1

# Which INCO Nickel Alloy is FREE-MACHINING?

**Consult the tables below  
for comparative properties of these two metals**

**Answer No. 1...**

### TOUGH YET EASY TO MACHINE

Engineers and screw machine products manufacturers already know this metal. Introduced several years ago, "R" Monel offers the corrosion resistance, toughness and strength of regular Monel, plus improved machining characteristics.

Readily fabricated by cold forming, "R" Monel is available as hot-rolled and

cold-drawn rounds, squares and hexagons. This INCO Nickel Alloy is well suited for automatic production of rust proof screw machine parts, yet has mechanical properties at least equal to steel screw stock (SAE 1112), and is actually tougher.

### PROPERTIES OF "R" MONEL

Condition	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elongation in 2 in. per cent	Hardness BHN 10-mm. ball 3000 lb.
Cold-drawn, annealed ...	70-85	25-40	50-35	110-140
Cold-drawn, as-drawn ...	80-115	50-100	35-15	150-220
Hot-rolled, annealed ....	70-85	25-40	50-35	110-140
Hot-rolled, as rolled ....	75-90	35-60	45-25	120-170

### PROPERTIES OF SAE 1112 STEEL SCREW STOCK

	Tensile Strength 1000 psi	Yield Strength 1000 psi	Elongation in 2 in. per cent	Hardness BHN 10-mm. ball 3000 lb.
Cold-drawn, as-drawn ...	80-100	70-80	20-10	170-200
Hot-rolled, as rolled ....	60-80	35-55	40-30	125-150

## QUESTION No. 2

# Which is free-machining and also HARDENABLE by HEAT TREATMENT?

**Answer No. 2...**

### OFFER EXTRA HARDNESS AND STRENGTH

This metal is the latest addition to the family of INCO Nickel Alloys. Its name... "KR" Monel. Like "R" Monel, "KR" Monel combines corrosion resistance and strength with improved machining.

But "KR" offers a big plus... through heat treatment this un-

usual metal develops exceptional hardness and strength.

A non-magnetic alloy, "KR" Monel is suitable for production of corrosion-resisting parts, and can be heat-treated after machining.

For complete information on these and other  
Inco Nickel Alloys, write to:

**THE INTERNATIONAL NICKEL COMPANY, INC.**  
67 Wall Street, New York, N. Y.

### PROPERTIES OF "KR" MONEL

Condition	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elonga- tion in 2 in. per cent	Hardness BHN 10-mm. ball 3000 kg.
Cold-drawn, as-drawn ...	100-125	70-100	35-15	175-250
Cold-drawn, heat-treated..	140-170	100-130	30-15	260-320
Hot-rolled, as rolled.....	90-120	40- 85	45-30	140-225
Hot-rolled, heat-treated..	135-160	90-120	30-20	260-300

The Working of  
HIGH-NICKEL ALLOYS

Machining

Monel "R" Monel "KR" Monel

Machining Techniques for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. Write for as many copies as you can use and also for the reprint "The Working of High Nickel Alloys."

# *Better* **LUBRICATION** MEANS *Better Maintenance*



• Excessive wear and difficult maintenance often result from inadequate lubrication.

Sinclair provides a range of specialized oils and greases for *better lubrication of MACHINING EQUIPMENT*. These lubricants together with Sinclair Cutting Oils

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(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

## **SINCLAIR INDUSTRIAL OILS**

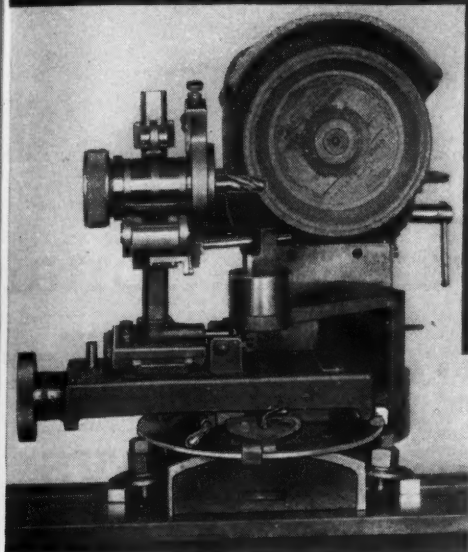
FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N.Y.



NEW ATTACHMENT  
GENERATES RADII ON END MILLS  
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*Simple, sturdy construction  
of Meyers Radiform insures  
fast operation and long,  
trouble-free performance.*

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Pat. Pending

Meyers Radiform Attachment for generating predetermined precision radii on spiral fluted end mills without previous wheel forming. Other Radiform attachments available for supporting

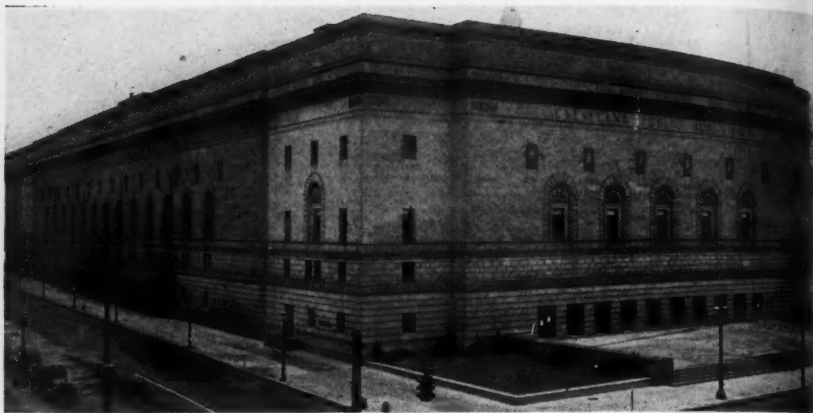
tool bits, milling cutters, die sinking tools and other forming tools to be generated directly against a grinding wheel. Time and cost of forming wheels is eliminated.

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PUBLIC AUDITORIUM, CLEVELAND, OHIO

# 26th Annual National Metal Congress *and* War Conference Displays

at Public Auditorium, Cleveland, Ohio,  
October 16 - 20

**M**ORE than 325 manufacturers, state and civic organizations are planning, for the 26th Annual National Metal Congress and War Conference Displays to be held in the Public Auditorium, Cleveland, Ohio, from October 16th to 20th, exhibits that range from ferrous and non-ferrous metals to processes and equipment for their production, fabrication, handling, treatment and use.

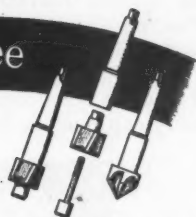
Sponsored by the American Society for Metals, in cooperation with the American Welding Society and the Iron and Steel and Institute of Metals

Divisions of the American Institute of Mining and Metallurgical Engineers, the National Metal Congress this year will include the American Institute of Radium and X-Ray Society and the Society for Experimental Stress Analysis.

Altogether, some 150 lectures and papers will be presented by qualified authorities in the several branches of science and industry represented by these societies. The technical sessions of the American Society for Metals will be held at the Hollenden and Statler Hotels; the A. I. M. E. will be at



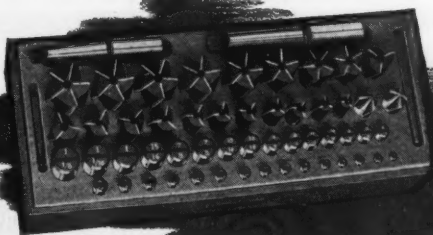
Ever count the leaves on a tree? Of course not! But better look close at our picture. It is an accurate diagram of the combinations that can be made up out of the assortment of holders, cutters, and pilots contained in one Gairing Interchangeable Counterbore set. • For a wide range of counterboring, countersinking and spot-facing operations this adds up to great economy and efficiency. Expensive delays due to lack of proper tools are greatly reduced.



*Yes, 281 different tools can be made from Counterbore Set C-13 shown below. All parts can be quickly replaced from stock. Complete in wooden case with hinged cover \$232.20.*

*Six other sets are available ranging from \$45.90, both in Morse Taper and straight shank type. For full description and prices write today for our Counterbore Bulletin.*

*The Gairing Tool Company, Detroit, 32, Michigan.*



**GAIRING**

Manufacturers of Standard Lock-Inserted Blade Cutting Tools

the Statler; the American Welding Society will have headquarters at the Hotel Cleveland; the American Industrial Radium and X-Ray Society will



**G. R. FITTERER**  
Campbell Memorial Lecturer

be located at the Hotel Hollenden, and the Society for Experimental Stress Analysis sessions will be held at the Carter Hotel.

In addition to the regular sessions of the National Metal Congress, the American Society for Metals will pre-



**HERBERT J. FRENCH**  
Past President, ASM, and Recipient of  
President's Medal

sent a series of practical panel-type afternoon and evening meetings on production problems of immediate and

future interest to the metal industry.

Subjects that have been listed for specific discussion during the five days of sessions include: metal powders and products, metals for railroads, metallurgical furnaces, induction heating, heat treatment, manufacture of quality steels, national emergency steels, surface peening, foundry metallurgy, salt baths, sub-zero treatments, surface finishes and protection, new de-




**WALTER E. JOMINY**  
Recipient of Albert Sauveur  
Achievement Award

velopments in the study of corrosion, application of quality control instruments, metal cutting and tool materials and lightweight construction.

At the annual dinner of the American Society for Metals, to be held at the Hotel Statler on Thursday evening, October 19th, the Society will be awarded the Ordnance Distinguished Service Award in recognition of its contributions to the war effort through metals education and training work.

One of the outstanding contributions of the Society was the organization of scores of special advisory committees of metal executives and engineers to work with war materials manufacturers. The services of these consulting committees were free to producers of ordnance equipment and material.

Industry  
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**8 Hours More Work  
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In cutting stainless steel bars, one plant could get only about 9 hours from a hacksaw blade ... and many cuts were concaved because of incorrect blade-tension. Then a *Red End* Blade was put in the same machine ... *correctly tensioned by Simonds' new technique* ... and delivered 17 hours of straight, smooth cutting, *almost double the former blade-life.*

You can get comparable re-

sults on *your own* power hacksawing operations. Have your Industrial Supply Distributor bring a Simonds engineer to demonstrate this new tensioning technique right on your own machines. Get in touch *now* with your distributor, or with the nearest Simonds branch office.

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**PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS**

October, 1944

MODERN MACHINE SHOP 169



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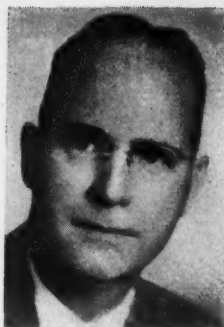
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Get Extreme Accuracy,  
High Spindle Speeds  
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Second Operation Machine

**CAPACITY:**  
 $\frac{1}{16}$ " to 1" with collets  
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1" to 5" with jaw chucks  
**Spindle Speeds**  
100 to 4000 r.p.m.

The combination of extreme accuracy, high spindle speeds and ease of operation means better results under the close tolerances of manufacturing standards both today and in the days to come. The ease and simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling

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## Officers and Trustees-Elect, American Society for Metals

### *Programs of the Technical Societies* American Society for Metals

(See also Schedule of Panel Discussion Meetings, Page 180)

#### MONDAY, OCTOBER 16

##### 9:30 A. M.—Surface Hardening

**Practical Aspects of the Selection of Frequency and Time Cycles for the Processing of Metallic Parts with Induction Heating**, by W. E. Benninghoff and H. B. Osborn, Jr., Ohio Crankshaft Co.

**Induction Hardening of Plain Carbon Steels**, by D. L. Martin and F. E. Wiley, General Electric Co.

**Shot for Metal Peening**, by O. E. Harder and J. T. Gow, Battelle Memorial Institute.

##### 9:30 A. M.—Hardenability

**Rates of Tempering in Cobalt Steels**, by E. A. Loria, Carnegie-Illinois Steel Corp.  
**Isothermal Transformation and End-Quench Hardenability of Some NE Steels**, by R. L. Rickett, J. G. Cutton, C. B. Bernhart, Jr., and J. R. Millikin, United States Steel Corp.

**Further Developments of the End-Quenched Hardenability Test**, by C. R. Wilks, Earnshaw Cook and Howard S. Avery, American Brake Shoe Co.

**A Hardenability Test for Low Carbon and Shallow Hardening Steels**, by O. W. McMullan, Youngstown Sheet & Tube Co.

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Words or pictures cannot truly describe the inherent fineness of quality and workmanship that we have built into our height gauge. But to actually use this rugged, beautifully built instrument is to realize why we are proud of our product. Into its design has gone the careful thought and experience which we have developed during twenty years of precision work.

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### 9:30 A. M.—Non-Ferrous Metal

- A Survey of Wrought Magnesium Alloy Fabrication**, by J. V. Winkler, Du Pont Chemical Co.
- The Copper-Manganese Equilibrium System**, by R. S. Dean, J. R. Long, T. R. Graham, E. V. Potter and E. T. Hayes, Bureau of Mines.
- Properties of Transitional Structure in Copper-Manganese Alloys**, by R. S. Dean, E. V. Potter and J. R. Long, Bureau of Mines.
- Age Hardening Copper-Manganese-Nickel Alloys**, by R. S. Dean, J. R. Long, T. R. Graham and C. W. Matthews, Bureau of Mines.

### 11:30 A. M.—Victory Session

*Ballroom, Hotel Statler*

## TUESDAY, OCTOBER 17

### 9:30 A. M.—Physical Properties

- The Mechanism of Failure of 18 Cr, 8 Ni Cracking Still Tubes**, by C. L. Clark, Timken Roller Bearing Co., and J. W. Freeman, University of Michigan.
- Capillarity of Metallic Surfaces**, by E. R. Parker, University of California, and R. Smoluchowski, General Electric Co.
- The Effect of Fiber on Notched Bar Tensile Strength Properties of a Heat Treated Low Alloy Steel**, by G. Sachs, J. D. Lubahn, L. J. Ebert and E. L. Aul, Case School of Applied Science.
- The Effects of Notches of Varying Depth on the Strength of Heat Treated Low Alloy Steels**, by G. Sachs, J. D. Lubahn and L. J. Ebert, Case School of Applied Science.

### 9:30 A. M.—Hardenability

- The Effect of Carbon Content on Hardenability**, by E. S. Rowland, J. Welch, R. G. Hill and J. J. Russ, Timken Roller Bearing Co.
- Air-Hardenability of Steels**, by C. B. Post, M. C. Fetzer and W. H. Fenstermacher, Carpenter Steel Co.
- The Partition of Molybdenum in Steel and Its Relation to Hardenability**, by Fred E. Bowman, Climax Molybdenum Co.
- The Rate of Diffusion of Molybdenum in Austenite and in Ferrite**, by John L. Ham, Climax Molybdenum Co.

### 9:30 A. M.—Aluminum and Magnesium Alloys

- New Developments in High Strength Aluminum Alloy Products**, by E. H. Dix, Jr., Aluminum Company of America.
- Aluminum Alloy Forging Materials and Design**, by L. W. Davis, Aluminum Company of America.
- The Properties of Aluminum Alloys Melted in an Induction Heated Crucible Furnace**, by James W. Poynter, Army Air Forces, Wright Field.
- Magnesium Sheet**, by P. T. Stroup and G. F. Sager, Aluminum Company of America, and J. B. West, American Magnesium Corp.

### 11:30 A. M.—Victory Session

*Ballroom, Hotel Statler*

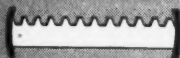
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# STANLEY

TRADE MARK



WEDNESDAY, OCTOBER 18

7:30 A. M.—Chapter Chairmen's Breakfast

9:30 A. M.—Annual Meeting of the American Society for Metals  
*Ballroom, Hotel Statler*

Edward de Mille Campbell Memorial Lecture, by G. R. Fitterer, Professor and  
Head, Department of Metallurgical Engineering, University of Pittsburgh

12:00 M.—Canadian Luncheon

THURSDAY, OCTOBER 19

9:30 A. M.—Melting and Special Alloys

A Comparison of Aluminum and Titanium Deoxidation for Preventing Strain  
Aging Embrittlement in Low Carbon Steel, by G. F. Comstock and J. R.  
Lewis, Titanium Alloy Manufacturing Co.

The Ar<sup>3</sup> Reaction in Some Iron-Cobalt Tungsten Alloys and the Same Modified  
With Chromium, by W. P. Sykes, General Electric Co.

The Basic Electric Melting Procedure for High Quality Alloy Steels, by A. I.  
Ascik, Sorel Industries, Limited.

9:30 A. M.—Tool Steel

The Dimensional Stability of Steel—Part I—Sub-atmospheric Transformation  
of Retained Austenite, by S. G. Fletcher and Morris Cohen, Massachusetts  
Institute of Technology.

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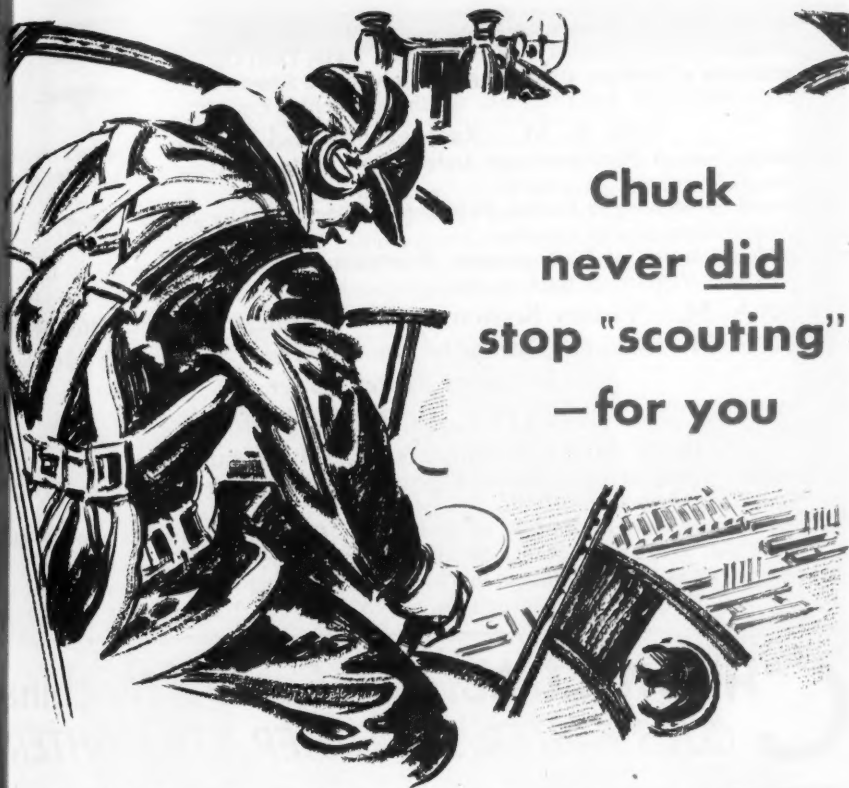
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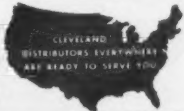


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**A Study of Subzero Treatments Applied to Molybdenum-Tungsten High Speed Steel**, by R. G. Kennedy, Jr., Cleveland Twist Drill Co.  
**Experiments of Sodium Cyaniding of High Speed Steel Prior to Hardening**, by John McIntyre, International Business Machine Co.

**9:30 A. M.—Radiography and Testing**

**A Comparison of Microhardness Indentation Tests**, by Douglas R. Tate, National Bureau of Standards.

**Improved Sensitivity in Double Exposure Radiography**, by James Rigbey, Ford Motor Company of Canada.

**The Interpretation of Radiographs: Particularly of Aircraft Parts**, by Leslie W. Ball, Triplett & Barton, Inc.

**11:30 A. M.—Victory Session; 12 M.—College Alumni Luncheon**

**7:00 P. M.—Annual Dinner of the American Society for Metals**  
*Ballroom, Hotel Statler*

**FRIDAY, OCTOBER 20**

**9:30 A. M.—Chromium and Molybdenum Alloys**

**Chromium Steels of Low Carbon Content**, by Russell Franks, Union Carbide and Carbon Research Labs.

**Characteristics and Properties of Some Cast Chromium-Molybdenum Steels**, by N. A. Ziegler and W. L. Meinhart, Crane Co.

**The Segregation of Molybdenum in Phosphorus Bearing Alloyed Gray Cast Iron**, by F. B. Rote, Wyman-Gordon Co. and W. P. Wood, University of Michigan.

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# A. S. M. Group Discussion Meetings

All Meetings in Music Hall and Ballroom of Public Auditorium, Cleveland

Monday, Oct. 16	Tuesday, Oct. 17	Wednesday, Oct. 18	Thursday, Oct. 19	Friday, Oct. 20
2:00 P. M.	2:00 P. M.	2:00 P. M.	2:00 P. M.	2:00 P. M.
Metal Cutting and Tool Materials	The Hardenability Band as a Basis for Purchase and Use of Steel	Metals for Railroads	Salt Baths	Heat Treatment
2:00 P. M.	2:00 P. M.	2:00 P. M.	2:00 P. M.	2:00 P. M.
Light Weight Construction	Magnesium	Metallurgical Furnaces	Aluminum	Foundry Metallurgy
4:00 P. M.	4:00 P. M.	4:00 P. M.	4:00 P. M.	4:00 P. M.
Sub-Zero Treatments	Instruments for Quality Control	Products From Metal Powders	Quality Control by Statistical Methods	Instruments for Quality Control
4:00 P. M.	4:00 P. M.	4:00 P. M.	4:00 P. M.	4:00 P. M.
Surface Finishes and Protection	A—Measurement of Linear Dimensions	Instruments for Quality Control	Quality Control by Statistical Methods	D—Atmosphere and Combustion
8:30 P. M.	4:00 P. M.	B—Means to Establish Identity		
Induction Heating	Surface Peening to Increase Fatigue Resistance	Instruments for Quality Control		
8:30 P. M.	8:30 P. M.	C—Detection and Measurement of Internal Defects		
What's New in the Study of Corrosion	National Emergency Steels in Use	Manufacture of Quality Steels		
8:30 P. M.	8:30 P. M.	8:30 P. M.		
	Tin; Tin Alloys; Tin Coatings			

Nationally known experts in the fields encompassed by these meetings will give brief talks on the various subdivisions of each topic. These men will then act as an information panel for open discussion and questions from the audience. Complete program, including subdivisions and names of panel members, will be circulated to those attending the National Metal Congress.

er, 1940



MODERN MACHINE SHOP 181

## A. I. M. E. Metals Divisions

MONDAY, OCTOBER 16

10:30 A. M.—Euclid Room, Hotel Statler

### Magnesium

The Relationship Between Magnesium Core Sand Mixtures and the Burning of Magnesium, by O. J. Myers, Wright Aeronautical Co.

Solubility of Manganese in Magnesium, by N. Tiner, Permanente Metals Corp.

2:00 P. M.—Euclid Room, Hotel Statler

### Grain Size of Magnesium

Grain Size and Properties of Sand Cast Magnesium, by R. S. Busk and C. W. Phillips, Dow Chemical Co.

Factors Affecting Grain Growth in Germination of Magnesium Alloy Castings, by A. T. Peters, R. S. Busk, and H. E. Elliott, Dow Chemical Co.

Grain Size of Sand Cast Magnesium Alloys, by Oscar Blohm, Hills-McCanna Co.

TUESDAY, OCTOBER 17

9:30 A. M. and 2:00 P. M.—Euclid Room, Hotel Statler

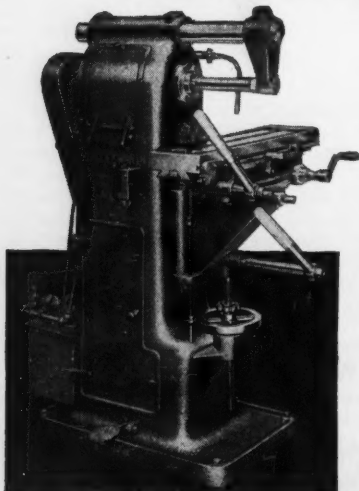
### Symposium on Creep of Non-Ferrous Metals and Alloys

Chairman—M. L. Gurghoff and E. E. Schumacher.

Application of Non-Ferrous Alloys in Stress Design, by J. J. Kanter, Crane Co.  
Creep Test Methods and the Interpretation of Creep Data, by P. G. McVetty

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**Creep Characteristics of a Phosphorized Copper**, by N. L. Burghoff and A. I. Blank, Chase Brass and Copper Co.  
**Creep Properties of Cold Drawn Annealed "B" Monel and Inconel**, by B. B. Betty, H. L. Eiselstein and P. P. Huston, Jr., International Nickel Co.  
**Creep Properties of Cast Bronze**, by H. E. Montgomery, The Lunkenheimer Co.  
**Creep Data on Die Cast Zinc Alloy**, by E. H. Kelton and B. B. Grissinger, New Jersey Zinc Co.  
**Creep Properties of Some Rolled Lead Alloys**, by A. A. Smith, Jr., American Smelting and Refining Co.

**2:00 P. M.—Lattice Room, Hotel Statler**

### **Non-Ferrous Production Metallurgy**

- Tin Smelting and Metallurgy**, by C. L. Mantell, Consulting Chemical Engineer.  
**Beryllium**, by Donald M. Liddell, Consulting Engineer.  
**Antimony: Its Metallurgy and Refining**, by Chung Yu Wang, Wah Chang Trading Corp., and Guy C. Riddell, Consulting Mining Engineer.

**WEDNESDAY, OCTOBER 18**

**2:00 P. M.—Pine Room, Hotel Statler**

### **General Session**

- Orientation Structure on the Surface of Cast Metals**, by Gerald Edmunds, New Jersey Zinc Co.

## **NEBEL Geared Head Lathes**

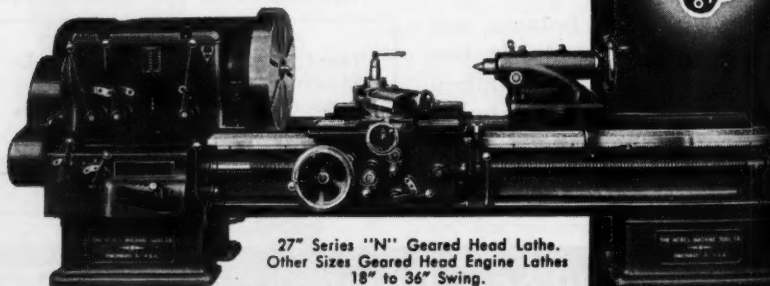
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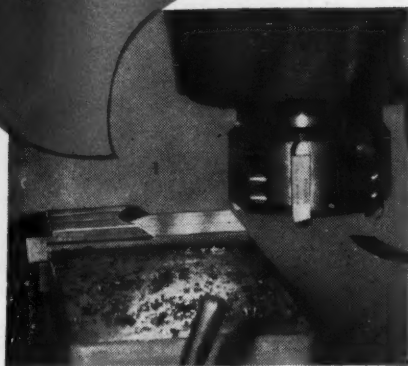


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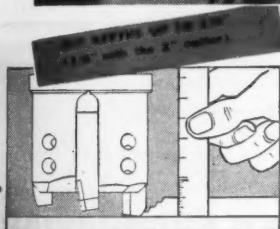
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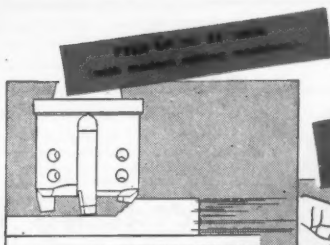
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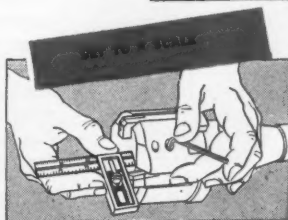
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**The Hardness of Silver-Antimony Solid Solutions**, by R. M. Treco and J. H. Frye, Lehigh University.

**Substitute Solders on the 85-15 Lead-Tin Type**, by James B. Russell, and J. O. Mack, Naval Research Laboratory.

### **IRON AND STEEL DIVISION**

**MONDAY, OCTOBER 16**

**2:00 P. M.—Pine Room, Hotel Statler**

#### **General Session**

**Recovery of Cold Worked Aluminum-Iron as Detected by Changes in Magnetic Properties**, by J. S. Stanley, Westinghouse Electric and Mfg. Co.

**Distribution of Carbon Between Titanium and Iron in Steels**, by W. P. Fishel and Bryson Robertson, Vanderbilt University.

**Transformation of Austenite in a 3% Chromium 1% Carbon Steel**, by E. P. Klier, Pennsylvania State College.

**TUESDAY, OCTOBER 17**

**10:00 A. M.—Pine Room, Hotel Statler**

#### **General Session**

**Measurement and Control of Hydrogen Embrittlement in Type 440C Stainless Steel Wire**, by C. A. Zapffe and M. Eleanor Haslein, Rustless Iron and Steel Corp.

**Effect of Time Storage on Ductility of Welded Test Specimens**, by C. E. Jackson and G. G. Luther, Naval Research Laboratory.



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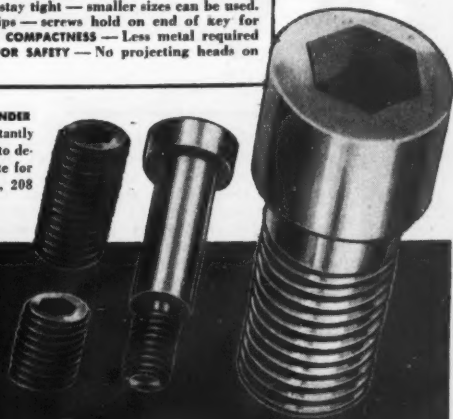
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**2:00 P. M.—Pine Room, Hotel Statler**

**Symposium on Recent Developments in Dilatometric Analysis**

**Chairmen—F. M. Walters, Jr., and Howard Scott.**

**Dilatometric Analysis of Sub-atmospheric Transformations**, by R. D. Potter, Massachusetts Institute of Technology.

**A High-speed Dilatometer and the Transformational Behavior of Six Steels**, by A. L. Christiansen, E. C. Nelson, and C. E. Jackson, Naval Research Laboratory.

**Precise Expansion Measurements on Non-Ferrous Alloys and Glasses**, by W. E. Kingston, Sylvania Electric Products, Inc.

**An Interference Type Dilatometer and Some Typical Results**, by W. L. Fink and L. A. Willey, Aluminum Co. of America.

**WEDNESDAY, OCTOBER 18**

**2:00 P. M.—Euclid Room, Hotel Statler**

**Symposium on Steelmaking**

**Chairmen—L. F. Reinartz and H. K. Work.**

**Theoretical and Practical Aspects of Deoxidation in Basic Open Hearth Practice**, by T. S. Washburn, Inland Steel Co.

**Slag-Metal-Oxygen Relationships in the Basic Open Hearth and Electric Processes**, by J. S. Marsh, Bethlehem Steel Co.

**A Rapid Laboratory Method for Estimating Basicity of Open-Hearth Slag**, by W. O. Philbrook, A. J. Jolly, Jr., and T. R. Henry, Wisconsin Steel Works.

**CARBOLOY—TIPPED SCRAPERS**

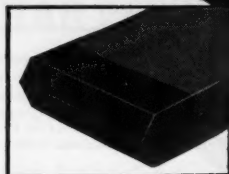
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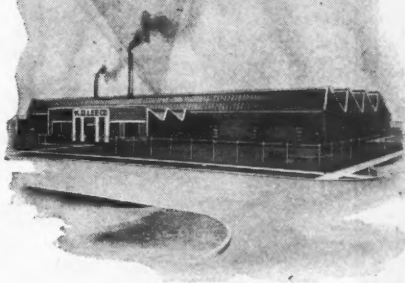


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**Application of pH Slag Basicity Measurements to Basic Open-Hearth Phosphorus Control**, by Michael Tenenbaum and C. C. Brown, Inland Steel Co.

### 9:30 A. M.—Fracture and Grain Size

**Fractography—A New Tool for Metallurgical Research**, by Carl A. Zapffe and Mason Clogg, Jr., Rustless Iron and Steel Corp.

**Cleavage Structures of Iron-Silicon Alloys**, by Carl A. Zapffe and Mason Clogg, Jr., Rustless Iron and Steel Corp.

**Grain Shape and Grain Growth**, by David Harker, General Electric Co., and Earl R. Parker, University of California.

**Fracture Studies of Soldered Joints**, by F. Berman and R. H. Harrington, General Electric Co.

### 9:30 A. M.—Rolling and Graphitization

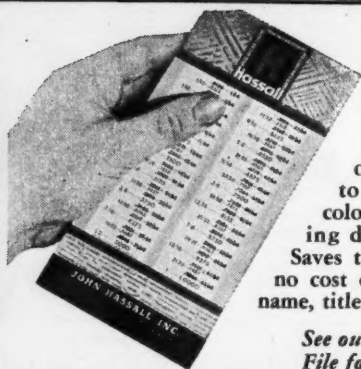
**Annealing Studies on Cold-Rolled Iron and Iron Binary Alloys**, by C. R. Austin, L. A. Luini and R. W. Lindsay, Pennsylvania State College.

**The Effect of Cold Rolling on the Structure of Hadfield Manganese Steel**, by Norman P. Goss, Cold Metal Products Co.

**Factors Controlling Graphitization of Carbon Steels at Subcritical Temperatures**, by C. R. Austin, Pennsylvania State College, and M. C. Fetzer, Carpenter Steel Co.

### 11:30 A. M.—Victory Session

*Ballroom, Hotel Statler*



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# Society for Experimental Stress Analysis

Annual Fall Meeting, Hotel Statler, October 17, 18, 19 and 20

**TUESDAY, OCTOBER 17**

**10:00 A. M.—Grand Ballroom, Hotel Carter**

**Words of Welcome by President W. M. Murray**

## Technical Session

**Chairman—C. O. Dohrenwend, Armour Research Foundation.**

**Shot Peening to Improve Fatigue Resistance**, by O. J. Horger and H. R. Neifert,  
The Timken Roller Bearing Co.

**Plastic-Flow Problems by Photo-Grid Methods**, by J. F. Harding and C. P.  
O'Haven, Armour Research Foundation.

**Load Distribution in Riveted and Spot-Welded Joints**, by M. Goland and L. D.  
Morris, Curtiss-Wright Corp.

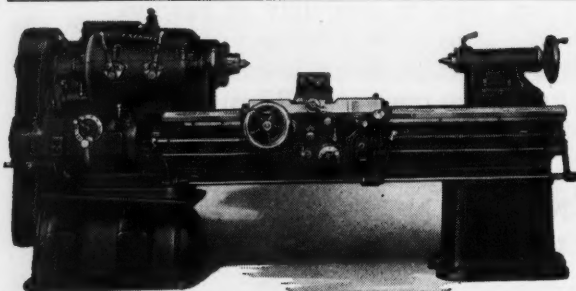
**2:30 P. M.—Grand Ballroom, Hotel Carter**

## Technical Session

**Chairman—O. J. Horger, The Timken Roller Bearing Co.**

**Residual Stress Studies of Life Improving Surface Treatments**, by R. W.  
Greaves, E. C. Kirstowsky and C. Lipson, Chrysler Corp.

**New Approaches to Engineering Design**, by E. E. Stilson, R. H. Peterson and  
R. C. Pocock, Bendix Aviation Corp.



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**WEDNESDAY, OCTOBER 18**

**10:00 A. M.—Grand Ballroom, Hotel Carter**

**Symposium on Crankshaft Stresses**

**Chairman—C. Lipson, Chrysler Corp.**

**Structural Evolution of a Crankshaft**, by S. Oldberg and C. Lipson, Chrysler Corp.

**Determination of Operating Loads and Stresses in Crankshafts**, by A. Goloff, Caterpillar Tractor Co.

**Metallurgical Processing of Packard Built Rolls-Royce Crankshafts**, by M. L. Frey, Packard Motor Car Co.

**2:30 P. M.—Grand Ballroom, Hotel Carter**

**Technical Session**

**Chairman—J. M. Lessells, Massachusetts Institute of Technology.**

**Full Scale Fatigue Testing of Crankshafts**, by C. W. Gadd and N. A. Ochiltree, General Motors Research Laboratories.

**Determining Crankshaft Durability for Increased Performance of In-Line Engine**, by W. Osborn, Sterling Engine Co.

**THURSDAY, OCTOBER 19**

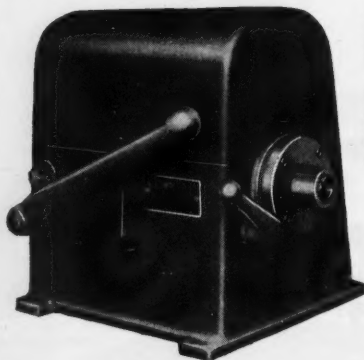
**10:00 A. M.—Grand Ballroom, Hotel Carter**

**Technical Session**

**Chairman—C. W. MacGregor, Massachusetts Institute of Technology.**

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**The Application of Stress Models to Specific Structural Problems**, by S. F. Tingley, Goodyear Aircraft Corp.

**Electrical Analogy for Shear Lag Problems**, by R. E. Newton, Curtiss Wright Corp.

**Electric Method for the Solution of Laplace's Equation**, by V. Paschkis, Columbia University.

**6:30 P. M.**—*S.E.S.A. Dinner, Grand Ballroom, Hotel Carter*

**FRIDAY, OCTOBER 20**

**10:00 A. M.**—*Grand Ballroom, Hotel Carter*

### **Technical Session**

**Chairman**—E. L. Shaw, Goodyear Aircraft Corp.

**Precision Determination of Weight by Means of Bonded Strain Gages**, by A. L. Thurston, Cox & Stevens Aircraft Corp., and R. W. Cushman, The Foxboro Co.

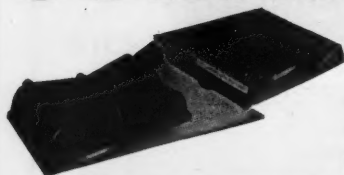
**The Magnetic Coupled-Torque Meter**, by B. F. Langer, Westinghouse Research Laboratories.

**Impact Stress Analysis by Brittle Coatings**, by G. Ellis, Magnaflux Corp.

**2:30 P. M.**—*Grand Ballroom, Hotel Carter*

**Special Session on Electrical Strain Gage Techniques**

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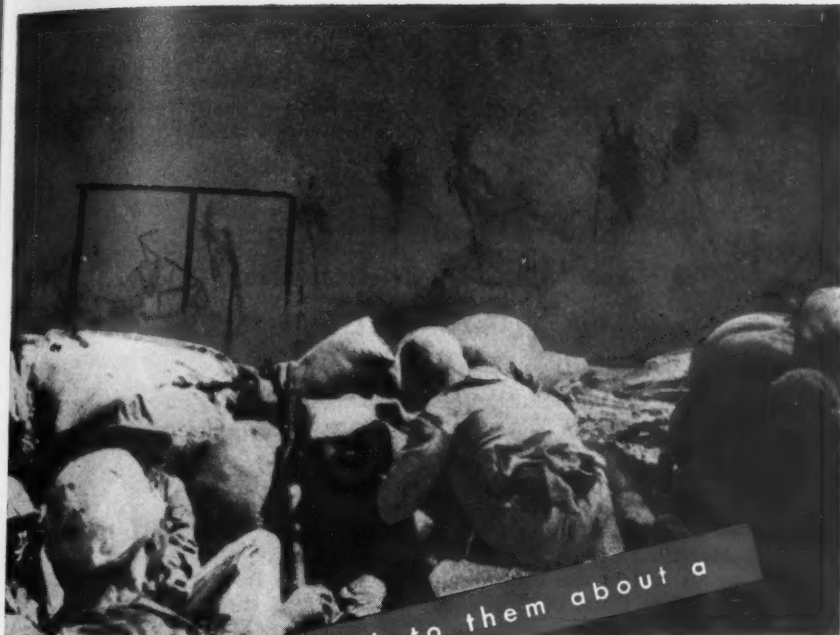
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They couldn't hear it. In the roar of that tornado, as they fought and fell, so far from the hills of home, they couldn't hear the words: " . . . history repeats . . . and what will we get out of it but . . . how the hell can we police . . . the next one will be against . . . already sowing the seeds for . . . and twenty years from now, brother . . . the Third World War . . . " In elevators, on the street, in plush chairs that let you down easy, in columns and editorials and from the political stump.

What is the matter with us? Can't we at home at least go into peace with some spark of their courage and determination that this war is not another mockery, not just another World War? Let no man give voice to that weak and deadly cynicism. Let him stand up and think straight and have the courage to call the lie to any man in public or private life who fails to do the same.

And let each of us do everything humanly possible to help win this war sooner . . . buy War Bonds—give blood—boycott the black market . . . and plan ahead now for a better America than we had before.

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MODERN MACHINE SHOP 197

Chairman—G. S. Burr, Forging Research Association.  
**Electric Gaging Systems: Their Selection and Application**, by H. C. Robert,  
University of Illinois.  
**Open Forum for Discussion on Characteristics of Amplifiers, Characteristics of  
Galvanometers, Calibration Circuits, Methods of Recording, Use of Crystals  
in Stress Analysis, and Additional Topics Put Forward by the Audience.**

## American Welding Society

Twenty-Fifth Annual Meeting, Hotel Cleveland, October 16-19

MONDAY, OCTOBER 16

9:30 A. M.—Opening Session

Chairman—David Arnott, President, American Welding Society.

Vice-Chairman—E. V. David, Chairman, Convention Committee.

Presentation of Medals and Prizes.

### Welding Aids the War Effort

**Welding as an Aid in Shipbuilding Construction**, by Admiral H. L. Vickery,  
U. S. Maritime Commission.

**Welding as an Aid in the Fabrication of Ordnance Equipment**, by Col. S. B.  
Ritchie, Office, Chief of Ordnance.

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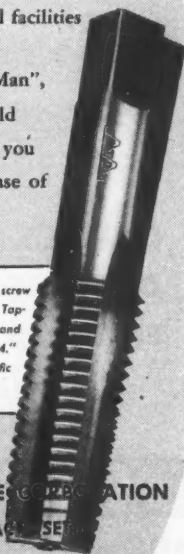


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**Welding in Aircraft Construction**, by W. B. Stout, Consolidated Vultee Aircraft Corporation.

## **2:00 P. M.—Welding and Cutting in Heavy Industries**

**Chairman**—R. J. Yarrow, Republic Structural Iron Works.

**Vice-Chairman**—J. M. Driscoll, Air Reduction Sales Co.

**Fundamentals of Heavy Cutting**, by G. L. Walker and H. G. Hughey, Air Reduction Sales Co.

**Steel Mill Maintenance**, by E. W. Gruber, Wheeling Steel Corp.

**Unusual Applications of Gas Cutting in Ordnance Fabrication**, by C. M. Underwood, Northern Ordnance, Inc.

**Procedure Control of Automatic Welding Processes**, by A. E. Bedell and J. B. Quigley, Graver Tank & Mfg. Co., Inc.

## **2:00 P. M.—Railroad and Transportation**

**Chairman**—J. W. Sheffer, American Car and Foundry Co.

**Vice-Chairman**—A. G. Oehler, Railway Age.

**Welding of Aluminum Tank Cars**, by A. H. Woollen, Railroad Sales, Aluminum Co. of America.

**Railroad Welding**, by John McMullen, Erie R. R.

## **2:00 P. M.—Weldability**

**Chairman**—A. B. Kinzel, Union Carbide & Carbon Corp.



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**Vice-Chairman**—C. H. Jennings, Westinghouse Electric & Mfg. Co.  
**Welding of Manganese Steels**, by W. B. Brooks and A. G. Waggoner, Cramp Shipbuilding Co.

**High Tensile Manganese-Silicon Steels for Welded Fabrication**, by G. G. Luther and F. H. Laxar, Naval Research Lab.

**The Bead-Weld Nick-Bend Test for Ductility**, by C. E. Jackson and G. G. Luther, Naval Research Lab.

**The Influence of Minor Variables of Weldability**, by R. D. Stout, S. S. Tor and G. E. Doan, Lehigh University.

### 8:00 P. M.—Adams' Lecture

**Chairman**—Wendell F. Hess, Rensselaer Polytechnic Institute.

**Vice-Chairman**—R. H. Aborn, United States Steel Corp.

**Solid Phase Welding**, by A. B. Kinzel, Union Carbide & Carbon Corp.

### TUESDAY, OCTOBER 17

### 9:30 A. M.—Resistance Welding

**Chairman**—L. C. Bibber, Carnegie-Illinois Steel Corp.

**Vice-Chairman**—G. N. Sieger, S. M. S. Corp.

**Spot Welding Machines for Heavy Gauges of Ferrous and Non-Ferrous Metals**, by Mario Sciaky, Sciaky Bros.

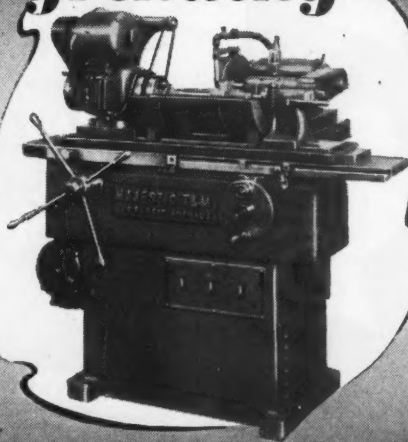
**Heat Transfer Across Contact Surfaces**, by W. B. Kouwenhoven, Dean, School of Engineering, Johns Hopkins University.

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**Problems in Spot Welding Heavy Mild Steel Plate**, by F. R. Hensel, E. I. Larson and E. F. Holt, P. R. Mallory & Co., Inc.

### 9:30 A. M.—Research

**Chairman**—S. L. Hoyt, Battelle Memorial Institute.

**Vice-Chairman**—R. E. Kinkead, Consulting Welding Engineer.

**The Effect of Postheating in Welding Medium Alloy Steels**, by M. A. Pugh and G. J. Siegel, Naval Research Laboratory.

**Stress Relieving Study**, by Prof. J. R. Stitt, Ohio State University.

**The Effects of Metallurgical Changes Due to Heat Treatment Upon the Fatigue Strength of Carbon-Steel Plates**, by W. H. Bruckner, and W. H. Munster, University of Illinois.

### 9:30 A. M.—Structural

**Chairman**—A. S. Low, The Austin Co.

**Vice-Chairman**—J. F. Maine, Republic Structural Iron Works.

**Standard Details for Welded Building Construction**, by H. W. Lawson, Bethlehem Steel Co.

**Field Welded Pressure and Variable Volume Storage Tanks**, by Fred L. Plummer, Hammond Iron Works.

### 2:00 P. M.—Resistance Welding

**Chairman**—R. E. Powell, Western Electric Co.

**Vice-Chairman**—H. C. Cogan, National Electric Welding Machines Co.



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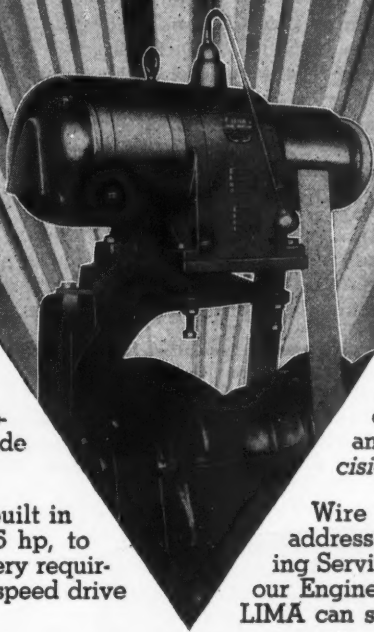
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**Low Reactance Cable for Portable Resistance Welders**, by Myron Zucker, Mar-  
worth G. Rees, Inc.

**The Flash Welding of Alloy Steels—Welding Techniques and Variables**, by  
J. J. Riley; **Metallurgical and Physical Characteristics**, by J. C. Barrett,  
Taylor-Winfield Corp.

**Small Portable Condenser Welding Set**, by E. M. Callender, E. G. Budd Mfg. Co.

### 2:00 P. M.—Research

**Chairman**—H. C. Boardman, Chicago Bridge & Iron Co.

**Vice-Chairman**—G. V. Slottman, Air Reduction Sales Co.

**Some Recent Developments in Stainless Steel Welding**, by D. L. Mathias, Mathias  
& Thermit Corp.

**Bi-axial Fatigue Strength of Low-Carbon Steels**, by George K. Morikawa and  
LeVan Griffis, Illinois Institute of Technology.

**Intergranular Corrosion of Stainless Steel Welds**, by Wm. T. Tiffin, University  
of Oklahoma.

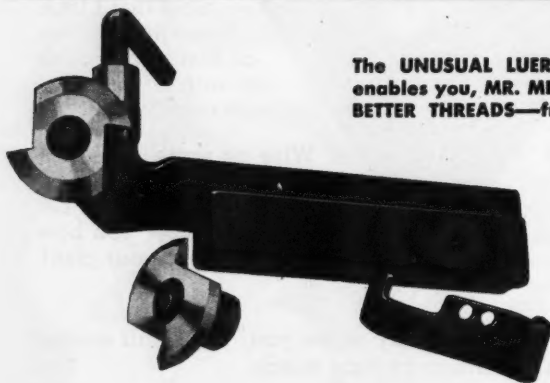
**Weldability Tests of Cast Steel**, by C. E. Jackson and F. S. McKenna, Navy  
Research Lab.

### 2:00 P. M.—Ships

**Chairman**—J. L. Wilson, American Bureau of Shipping.

**Vice-Chairman**—S. A. Midnight, American Shipbuilding Co.

**Controls Required for Sale and Economical Construction of Welded Ships**, by  
D. G. Maxson, Welding Consultant, Marinship Corp.



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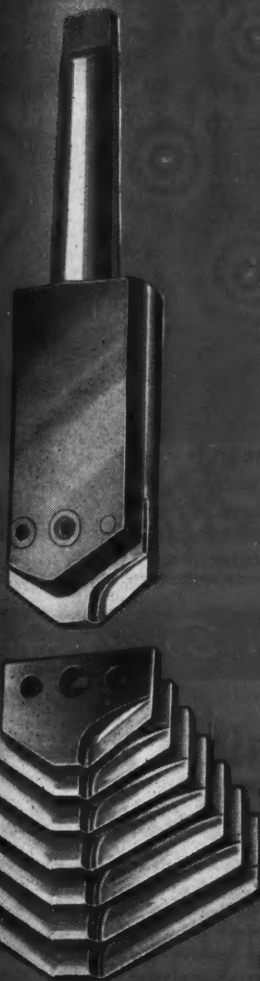
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**Technical Control of Welding in Ship Construction**, by M. H. MacKusick, California Shipbuilding Corp.

**Evolution of Welding in Shipbuilding**, by M. N. Maltseff, Western Pipe and Steel Co.

**Multiple and Stack Machine Cutting**, by A. H. Yoch, Air Reduction Sales Co.

**8:00 P. M.—University Research Conference**

**WEDNESDAY, OCTOBER 18**

**9:30 A. M.—Aircraft**

**Chairman**—G. S. Mikhlapov, National Research Council.

**Vice-Chairman**—C. W. Dodge, Sciaky Bros.

**Impact Strength of Arc Welded Joints in Aircraft Steel**, by H. O. Klinke, Republic Aviation Corp.

**Helium Shielded Arc Welding of Exhaust Collector Rings**, by Francis R. Rensverson, Lockheed Aircraft Corp.

**Multi-Arc Welding of Aluminum Alloys**, by M. R. Rivenburgh and C. W. Steward, Curtiss-Wright Corp.

**9:30 A. M.—Research**

**Chairman**—Isaac Harter, The Babcock & Wilcox Co.

**Vice-Chairman**—E. R. Seabloom, Crane Co.

**Weldability—as-Rolled vs. Heat-Treated High Strength Constructional Steels**, by Lt. S. A. Herres and W. L. Warner, Watertown Arsenal.



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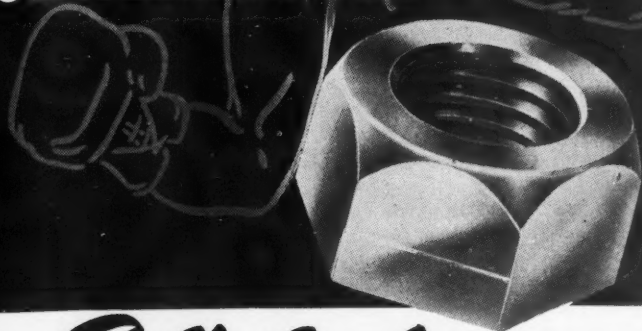
Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

**Lead Screw ground from solid AFTER hardening.**

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BEVERLY HILLS, CALIFORNIA



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## OF *Self-locking* NUTS

The Stover Self-locking Nut is a beautiful example of precision manufacturing—but it "packs tremendous stamina." Sixteen precision machines are employed to make and test it—and to give the vibration-defying grip that spotlights the Stover nut among modern fasteners.

New in principle, the Stover Self-locking Nut represents a notable advance over other locking devices, especially in its employment of the natural elasticity of metal to give it holding power; its one-piece construction without complicated assembly, and its ability to lock firmly at any point on the bolt.

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Every machine that vibrates will be a better machine if fastened with Stover Self-locking Nuts. Ask our representative to call in relation to your post-war plans.

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**SELF-LOCKING NUT**

**"IT WON'T SHAKE LOOSE"**

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MEETS ARMY AND NAVY SPECIFICATIONS

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Easton, Penna., Bushkill Drive • New York 17, N. Y., 101 Park Avenue  
Detroit 2, Mich., General Motors Building

REPRESENTATIVES IN PRINCIPAL CITIES

MODERN MACHINE SHOP 211

October, 1944

**The Effect of Time and Temperature on the Relief of Residual Stresses in Low Alloy Steels**, by J. K. McDowell and Paul C. Cunnick, Lt. Col., Ordnance Dept., Rock Island Arsenal.

**Development and Application of Modern Heavy Coated Arc Welding Electrodes** by D. C. Smith and W. G. Rinehart, Harnischfeger Corp.

### 2:00 P. M.—Aircraft

**Chairman**—G. O. Hoglund, Aluminum Co. of America.

**Vice-Chairman**—E. S. Jenkins, Curtiss-Wright Research Laboratory.

**The Geometry of a Spot Welding Tip and Its Relation to Tip Life**, by E. D. Crawford and C. W. Steward, Curtiss-Wright Corp.

**Survey of Chemical Cleaning Practices for Spot Welding Aluminum Alloys**, by F. M. Morris, Kaiser Cargo, Inc., Fleetwings Div.

**An Evaluation of Process Control of Aircraft Welding**, by P. H. Merriman, The Glenn L. Martin Co.

**Characteristics of Welding Arcs on Aluminum in Atmospheres of Helium and Argon**, by F. A. Wassell, General Electric Co.

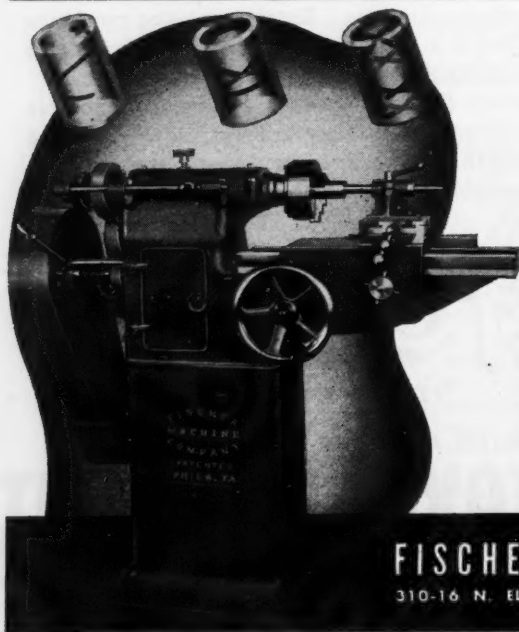
### 2:00 P. M.—Machinery

**Chairman**—A. E. Gibson, Wellman Engineering Co.

**Vice-Chairman**—R. J. Kriz, The James H. Herron Co.

**Production Problems and Production Control**, by E. C. Brekelbaum, Harnischfeger Corp.

**Routine Inspection and Salvage of Machinery Weldments**—Rough, Partial



## FISCHER *Oil Groovers*

A wide variety of grooves may be cut on the "FISCHER" . . . with minimum set-up time and cost.

Bearing in which groove is to be cut is mounted on revolving chuck secured on work spindle. Boring tool is secured to carriage slide which has a reciprocating motion timed with work spindle and lined by crank gear and connecting rod.

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MODERN MACHINE SHOP 213

October,  
October, 1944

**Machined and Machined**, by James W. Owens, Fairbanks, Morse & Co.  
**Welded Jigs and Fixtures**, by A. N. Kugler, Air Reduction Sales Co.  
**Design of Welded Machinery**, by John Mikulak, Electric Machinery Manufacturing Co.

## 2:00 P. M.—Piping and Pressure Vessels

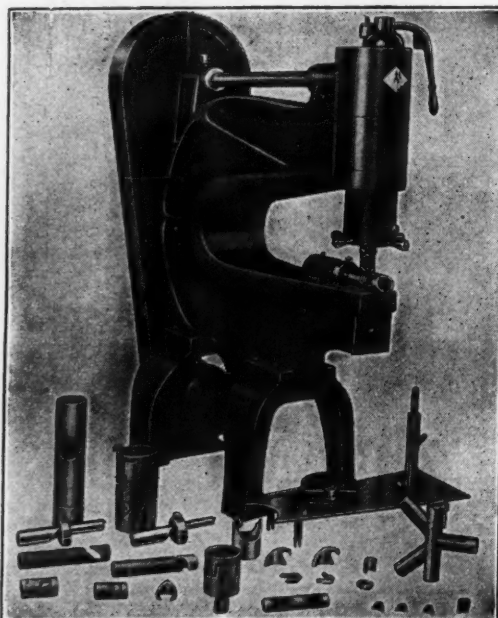
**Chairman**—A. C. Weigel, Combustion Engineering Co.  
**Vice-Chairman**—R. W. Emerson, Pittsburgh Piping & Equipment Co.  
**Pressure Vessel Welding**, by Edward B. McGuire, Hamler Boiler & Tank Co.  
**Normalizing of Welds in Carbon-Molybdenum Pipe by 60-Cycle Induction Heating**, by I. A. Rohrig and D. H. Corey, The Detroit Edison Co.  
**Properties of Welded Joints Between Dissimilar Metals**, by E. C. Chapman and R. E. Lorentz, Combustion Engineering Co.  
**Oxy-Acetylene Pressure Welding**, by A. R. Lytle, Union Carbide & Carbon Res. Labs.

## 6:30 P. M.—Section Officers Dinner and Conference

## THURSDAY, OCTOBER 19

## 9:30 A. M.—Foundry

**Chairman**—L. A. Danse, Cadillac Motor Car Div.  
**Vice-Chairman**—Austen J. Smith, The Lunkenheimer Co.  
**Arc Welding Practices in the Steel Foundry**, by Frank Kiper and Lawrence Gabes, Ohio Steel Foundry.



For **FAST** and **SAFE** cutting of sheet metal, duplicating parts, and to relieve other machine tools, investigate the

**SAVAGE NIBBLING MACHINE**  
**TUBE SLOTTING AND TUBE SHAPING**  
 For cutting flat sheets by template or to a scribed line.

**Cutting Capacities**  
 Flat Sheets Mild Steel  $\frac{3}{4}$ "  
 Tough Alloys  $\frac{5}{8}$ "

**Tubing**  
 Wall thickness to  $\frac{3}{8}$ "  
 1" I.D. to 36" O.D.

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**—FOR COUNTERBORING AND SPOT FACING OPERATIONS THAT SAVE THE TIME AND COST OF EXTRA SET-UPS, OTHER SLOWER MACHINING AND COMPLICATED ASSEMBLIES**

5/16" Dia.,	1/4" Shank
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7/16" "	1/4" "
1/2" "	1/4" "

$\frac{3}{16}$ " Dia.,	$\frac{1}{4}$ " Shank
$\frac{5}{16}$ " "	$\frac{1}{4}$ " "
$\frac{11}{16}$ " "	$\frac{1}{4}$ " "
$\frac{3}{8}$ " Dia.,	$\frac{5}{16}$ " Shank
$\frac{7}{16}$ " "	$\frac{5}{16}$ " "
$\frac{1}{2}$ " "	$\frac{5}{16}$ " "
$\frac{9}{16}$ " "	$\frac{5}{16}$ " "
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" "	$\frac{5}{16}$ " "

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**Machine Cutting of Risers, Flame Scarfing to Remove Padding, and Flame Gouging to Remove Webs and Defects**, by G. E. Bellew, Air Reduction Sales Co.

**Repair of Castings**, by L. A. Danse, Chairman, G. M. Metallurgical Committee, General Motors Corp.

### 9:30 A. M.—Miscellaneous

**Chairman**—W. E. Crawford, A. O. Smith Corp.

**Vice-Chairman**—A. L. Pfeil, Universal Power Corp.

**Low Temperature Joining**, by W. D. Wasserman and C. E. Swift, Eutectic Welding Alloys Co.

**A Method for Measuring the Bond Strength of Sprayed Metal Coatings**, by Kenneth Wilson, Metallizing Engineering Co.

**How Much Ductility Is Necessary for Structure or Machine?**, by W. J. Conley, Lincoln Electric Co.

### 2:00 P. M.—Business Meeting

### 3:00 P. M.—Board of Directors Meeting

---

## American Industrial Radium and X-Ray Society, Inc.

Annual Convention, Hollenden Hotel, October 19 and 20

THURSDAY, OCTOBER 19

### Morning—Technical Session

Three Technical Papers; Titles to Be Announced.

### Afternoon—Annual Meeting and 1944 Mehl Lecture

Election of Officers.

**Experimental Stress Analysis in Radiographically Sound Materials**, by George L. Clark, University of Illinois.

**Address by Retiring President**, Maynard B. Evans, Jr., Ternstedt Mfg. Division, General Motors Corp.



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October, 19



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**FRIDAY, OCTOBER 20**

***Morning and Afternoon—Technical Sessions***

**Requirements in Specifications for Uniform Radiographic Technique**, by George

A. Russ.

**Automatic Film Processing and Equipment**, by Robert Sarderson.

**X-Ray and Welding Control**, by John J. Chyle.

**Quality Control of Radiographs by a Direct Density Check**, by Alvin F. Co

**A Simplified Method of Film Evaluation**, by Emery Meschter.

**Method of Determining Metal Thickness Radiographically**, by H. P. Moyer

P. L. Kline.

**A Practical Comparison of Fluoroscopy with Radiography**, by Robert May

**Filtration**, by Don M. McCutcheon.

**Three Dimensional Radiography**, by Douglas Wineck.

**CLEVELAND SECTION**

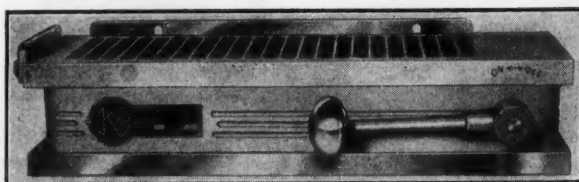
***American Industrial Radium and X-Ray Society***

**Monday Evening, October 16**

***Hotel Hollenden***

**Use of Microradiography in Identifying Defects in Castings**, by L. W. B  
Triplett & Barton Corp.

**KAR Permanent Magnet CHUCKS**



**Cannot Fail**  
**Hold Work Tight**  
**Generate No Heat**

An outstanding and exclusive advantage of the KAR Permanent Magnet Chuck is its ability to hold smaller pieces securely due to the close spacing of the pole pieces.

**Release Easily**  
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**Use No Power**



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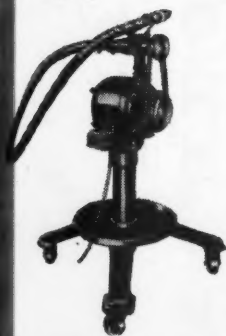
**GREAT BARRINGTON**

**MASSACHUSETTS**



**SAVE** *Critical* **TIME!**

**H-6**



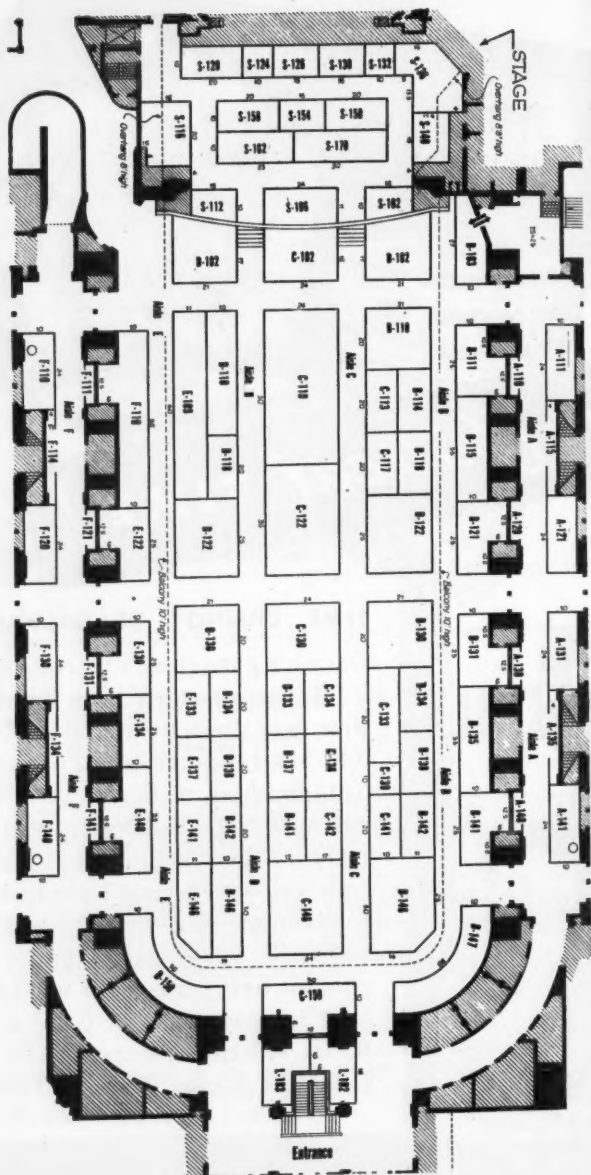
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Once it's gone there's no reclaiming it. But you can cut your finishing time 'way down with Haskins Flexible Shaft Equipment. Forget old hand-finishing methods. Your men will work faster and better, with less fatigue, the Haskins way. Every hour will see increased production. Man-hours—plus machine-hours—will really mean something. For important new time-saver methods, send for your copy of Catalog 45. R. G. Haskins Company, 619 So. California Avenue, Chicago, Illinois.



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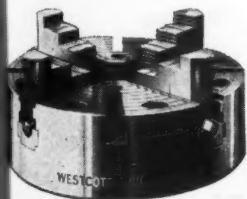
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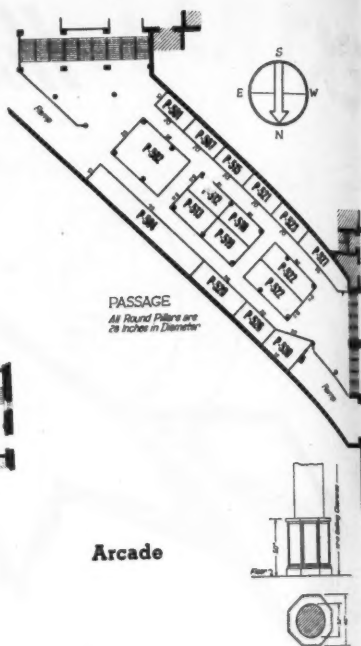
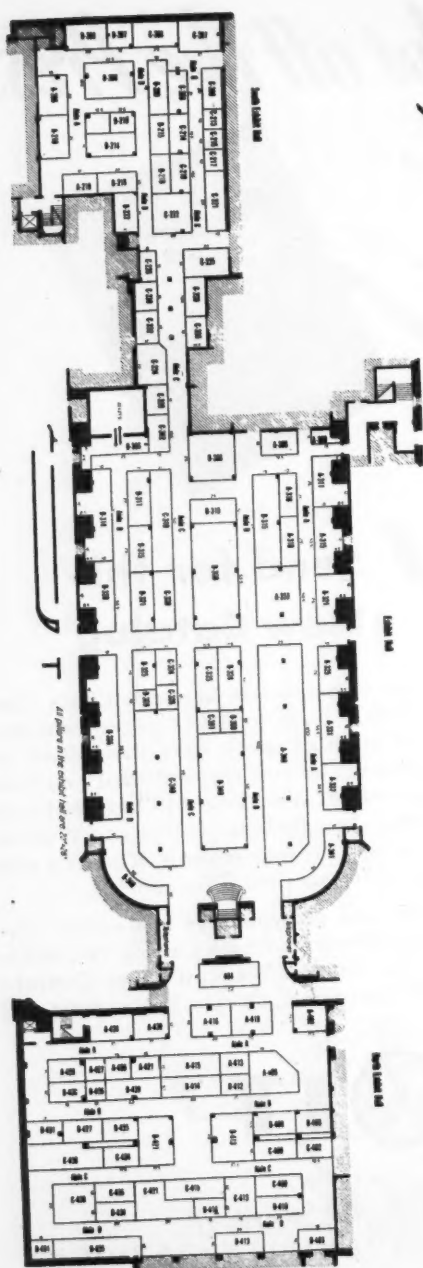
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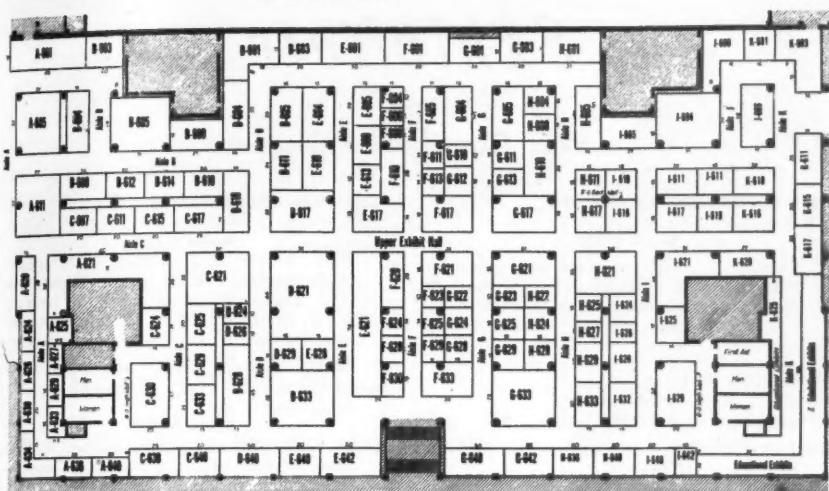
PASSAGE  
All Round Pillars are  
20 inches in Diameter

Arcade

**Floor Plan**  
Showing  
**Arrangement of**  
**War Conference**  
**Displays**  
at  
**Cleveland Public**  
**Auditorium**



# UPPER EXHIBIT HALL



THE Cleveland Public Auditorium, in which the War Conference Displays are to be presented, is divided into five sections, as follows: the Arena, the Upper Exhibition Hall, Lower Exhibit Hall, Arcade, and Lakeside Exhibit Hall. The Arena, with which the stage is included, is on the street level. The other four exhibit halls are on the lower level, reached by stairs from the Arena.

The entrance is from Lakeside Avenue and leads through the foyer into the Arena. Just inside the hall is a huge stairway leading to the lower level. Underneath the Arena is the section known as the Upper Exhibition Hall, while in the opposite direction is the Lower Exhibit Hall, the Arcade and the Lakeside Exhibit Hall.

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participating in the

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### **ACME TOOL CO.**

**Booth A-620**

(See H. & H. Research Co.)

### **AGET-DETROIT CO.**

Ann Arbor, Mich.

**Booth K-615**

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### **AJAX ELECTRIC CO., INC.**

Philadelphia

**Booth C-340**

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### **AJAX ELECTROTHERMIC CORP.**

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**Booth D-331**

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### **AJAX ENGINEERING CORP.**

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### **ALLISON CO.**

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**Booth D-315**

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### **ALLOY RODS CO.**

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**Booth E-642**

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Cincinnati, Ohio

**Booth A-413**

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### **ALVIE-FERGUSON CO.**

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**Booth F-610**

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P-516  
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October, 1944



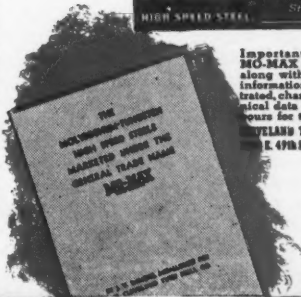
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### have 154,999,999 brothers!

MO-MAX tool totals run into "box-car figures". For example, one tool maker alone has turned out no less than 155 million cutting tools of MO-MAX. From this you can judge the wide acceptance now enjoyed by the first commercially available molybdenum high speed steel, a steel that has proved its leadership in ten years of test and performance.

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### **Booth C-113**

Roger Waindle, general manager; Frank Stalal, assistant chief engineer; M. C. Schwer, manager Detroit office; Paul Paige, designing engineer; Roy Knuch, foundry superintendent; Leo Bridgman, Charles Webb, and Jean Dejarnett, metallurgical engineers.

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### **Booth A-621**

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### **Booth B-103**

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**AMERICAN CHAIN & CABLE CO., INC.**

### **Booth D-321**

(See Campbell Division, Andrew C.)

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### **Booth H-601**

R. H. Landis, G. D. Johnston, P. E. Bickel, A. B. Fillicko, Ed. Edmunds, G. H. Bickel, C. Byron, W. E. Manning, M. C. Walker, J. Kirkland, J. J. Bean, O. J. DeLon, M. Wixson.

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### **Booth A-424**

(See Riehle Testing Machine Division.)

**AMERICAN MANGANESE STEEL DIVISION OF  
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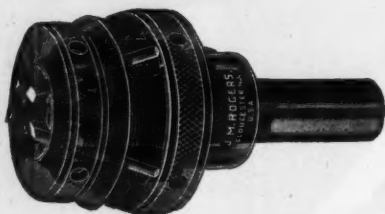
October, 1944

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now helping win its third war  
and still going strong.



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Easily Adjusted. Rigidly Locked.  
Rogers Built Since 1890.

**THE JOHN M. ROGERS  
TOOL CORP.**  
Gloucester City New Jersey

sentative; H. E. Johnson and H. S. Knight, engineers; E. Cook, chief metallurgist; H. H. Schaefer, assistant chief metallurgist; H. S. Avery, research metallurgist; H. B. Henss and J. L. Goheen, metallurgists.

## AMERICAN MACHINIST AND PRODUCT ENGINEERING

New York City

**Booth B-111**

Burnham Finney, editor and publisher, American Machinist; W. E. Kennedy, general manager; N. B. Stanton, assistant manager; John Haydock, managing editor; Rupert LeGrand, associate editor; B. C. Brosheer, associate editor. G. F. Nordholt, editor, Product Engineering; John Sasso, managing editor; R. E. Cleary, manager, research and promotion; G. V. Parrick, district manager.

## AMERICAN METAL MARKET

New York City

**Booth G-622**

R. A. Langer, secretary and advertising manager; George Ehrnstrom, Jr., and D. Fahnestock, representatives.

## AMERICAN PHOTOCOPY EQUIPMENT CO.

Chicago

**Booth A-337**

Arthur L. Creange, partner; Jos. S. Lederer, partner; C. A. Lederer, service engineer; and Wm. H. Cohen, Bert Harris, L. Cohen, and J. W. Lane, field engineers.

## AMPCO METAL, INC.

Milwaukee

**Booth D-130**

Ray W. Uecker, secretary-treasurer; S. C. Lawson, manager, central division; Earl Svoboda, Cleveland district manager; K. Bybee, Detroit district manager; J. L. Cook, Cincinnati district manager; J. L. Heuser, Pittsburgh district manager; B. Norton, manager, welding division; E. Sorenson, assistant manager, welding division; H. Hose, welding engineer; W. Claman, sales engineer, welding division.

## AMERICAN PORCELAIN ENAMELING CO.

Muskegon, Mich.

**Booth C-428**

## AMERICAN SOCIETY FOR METALS

Cleveland

**Booth S-116**

## AMERICAN TYPE FOUNDERS, INC.

Elizabeth, N. J.

**Booth G-633**

John C. Righter, Jr., division manager; Douglas Bennett, engineering; Arthur Rock, production control; Howard Henss, sales; Mark Soubie, sales; Frank H. Post, assistant division manager; G. Van Steenberg, assistant division manager.

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Cleveland

**Booth A-635**



# Making broaches comes pretty close to being a *Fine Art*

What is thought to  
be the largest solid  
high speed steel  
gear tooth broach  
(893 lb.) ever  
produced.



IT CUTS **55**  
INTERNAL GEAR TEETH  
IN A COUPLING SLEEVE  
**48 TIMES** FASTER WITH  
INCREASED ACCURACY  
AND CONSISTENCY  
THAN THESE TEETH  
WERE CUT BY THE  
PREVIOUS OPERATION

There is no branch of tool making that requires as much actual first-hand experience as the design and manufacture of accurate and dependable broaches. Seemingly, negligible factors often result in large differences in the effectiveness and the life of the broach. Very seldom are any two broach problems just alike and only the broach organization with wide experience is capable of evaluating all the factors which enter individual broaching problems.

For maximum economy and effectiveness, let such an organization supply your broaching tools.



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CO. - L. - BROOKLYN, N. Y.

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SPECIALISTS ON SPUR AND HELICAL  
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October, 1944

MODERN MACHINE SHOP 229

# Johnson Furnaces

**2300° F. in 30 Minutes with  
No. 120 High-Speed Steel  
Heat-Treating Furnace**

**1500° F. in  
5 Minutes**



A low cost Unit that is unexcelled for heat-treating high speed steels, for hardening dies, punches and tools. Firebox is 5" high, 7 7/8" wide, 13 1/2" long. Heavily lined throughout with insulating refractory. Equipped with Carbofrax hearth, G.E. Motor and Johnson blower. Temperatures easily regulated.

**\$129.50**

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623 E. Ave. N. W., Cedar Rapids, Iowa.

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**ANDERSON OIL CO., F. E.**  
Portland, Conn.

**Booth A-420**

F. E. Anderson, partner; A. W. Ackerman, chief chemist; H. E. Gallic, T. C. Bradford, and C. A. Sluhan, service engineers.  
**ANSCO, A DIVISION OF GENERAL ANILINE & FILM CORP.**

Binghamton, N. Y.

**Booth C-203**

**ARMSTRONG CORK CO.**

Lancaster, Pa.

**Booth C-615**

B. W. Adams, H. C. Brown, Jr., S. M. Jenkins, F. W. Muller, J. G. Seanor, J. M. Smith.

**ARO EQUIPMENT CORP.**

Bryan, Ohio

**Booth I-624**

R. W. Morrison, manager, industrial tool division; E. L. Jackson, sales division; C. P. Enston, field engineer; L. O. Barrett, field engineer; C. W. Ginter, factory manager; J. E. Allen, assistant to the president.

**AUTOMATIC TEMPERATURE CONTROL CO., INC.**  
Philadelphia

**Booth P-513**

W. L. Hunt, research director; G. H. Johnson, president; W. W. Winters, advertising manager; G. E. Gress, acting sales manager; G. S. Frazee, C. Adams, H. Palmer, H. W. Munday, R. R. Gannon, and S. Hager, representatives.

**AUTOMATIC TRANSPORTATION CO.**

Division of Yale & Towne Mfg. Co.  
Chicago

**Booth A-409**

Chicago office—E. F. Twyman, general manager; R. L. Wolter, sales manager; L. Bertram, manager sales promotion; M. Johnson, assistant sales manager, Transporter division; R. M. Whitney, assistant sales manager, truck division; L. R. Linley, sales representative; P. W. Voss, sales representative. Milwaukee office—O. Rosche, sales representative. Cleveland office—B. I. Florey, sales representative. Buffalo office—N. L. Gorman, sales representative. Detroit office—J. A. Gault, sales representative. Cincinnati office—Batsner Brothers, sales representative. Pittsburgh office—L. N. Crissman, sales representative. New York office—R. Smith Associates, eastern general sales agents.

**AUTOMOTIVE AND AVIATION INDUSTRIES**  
Philadelphia

**Booth G-623**

Jos. S. Hildreth, vice-president and manager, automotive division; Julian Chase, recting editor, automotive division; Geschellin, Detroit technical editor; E. Boyd, sales representative; John Hildreth, sales representative.

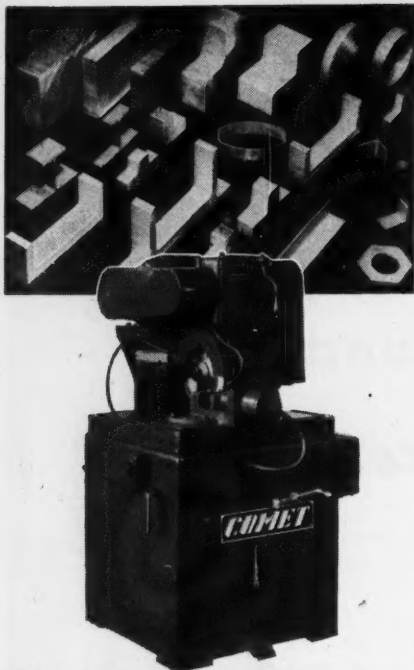
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These are precision ground burs . . . as accurately ground as the finest milling cutters. They are *machine ground* from solid . . . are accurate in all details . . . bound to give you more for your money than any common garden variety of hand-ground bur can possibly give. Each one is a precision cutting tool — every flute spaced exactly with relation to all others — each cutting edge with precisely the correct rake and chip clearance. And every one is ground concentric, to run true on its shank. There is no guesswork or human error in these burs. Our special bur grinding machinery takes out all the human error — assures you of smoother operation, smoother results in finished work, greater production per hour and per bur. They may be re-sharpened many times over.

IMMEDIATE DELIVERY of the types pictured here is now possible through our increased bur production facilities. Try these Pratt & Whitney Kellerflex Burs — and see for yourself the extra long cutting life they give.

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If you require accurate, high-speed cutting of non-ferrous metals and other materials, here is your machine. Cuts by smooth, fast, milling action. Pneumatic hydraulic feed is coordinated with speed of cutting blade. Vise synchronized with action of ram. No vibration because of weight distribution. Has 4 speed transmission and variable feed mechanism. Built-in coolant system. Properly operated, blade breakage is eliminated. Write or wire for free literature.

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### BAILEY METER CO. Cleveland

#### Booth I-640

H. M. Hammond, manager of sales and engineering; C. C. McClelland, manager, Cleveland sales office; P. S. Dickey, research engineer; J. F. Luhrs, mechanical engineer; E. B. Bossart, mechanical engineer.

### BAKER & CO., INC. Newark, N. J.

#### Booth A-421

Nicholas Schilling, in charge of furnace division.

### BARRETT-CRAVENS CO. Chicago

#### Booth C-633

A. M. Barrett, president; E. J. Heimer, vice president; O. L. Jenkins, district sales manager; H. C. Morrison, sales engineer; James Morrison, sales engineer.

### BASTIAN-BLESSING CO. Chicago

#### Booth P-512

Ellsworth L. Mills, vice-president; R. L. Poethig, sales manager; H. A. Goodwin, district manager; J. W. Green, manager, L. P. gas division; Frank Fisher, welding and cutting division manager.

### BAUSCH & LOMB OPTICAL COMPANY, Rochester, N. Y.

#### Booth C-607

I. L. Nixon, sales manager, scientific instrument division; M. H. Stevens, assistant sales manager in charge of industrial sales; C. C. Nitchie, sales engineer; E. G. Koch, sales engineer; P. M. Stoehr, sales engineer; J. H. Mead, Chicago district sales engineer; L. B. McKinley, Cleveland-Pittsburgh district sales engineer; H. L. Shipp, Detroit district sales engineer.

### BELL & GOSSETT CO. Morton Grove, Ill.

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E. J. Gossett, president; W. P. Gossett,

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WEAR LONGER

CHROMIUM PLATING offers excellent resistance to wear principally because of its extreme hardness. Chromium is accepted as having a value of 1000 Brinell with a No. 9 position on the Mohs scale. The diamond is No. 10.

Sometimes chromium plate does not offer adequate protection to the base metal, however, when this occurs, it is generally evident that the coating is too thin or the plating procedure itself is at fault.

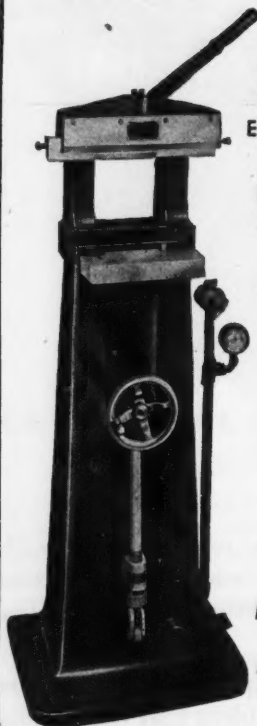
BECAUSE ELLSTROM GAGES ARE CORRECTLY PLATED AND UNCONDITIONALLY GUARANTEED ACCURATE, all Ellstrom-made chromium plated gage blocks successfully resist the corroding effects of moisture or acids. This means still longer wear with greater precision.

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**MARKING  
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**REQUIRES  
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STAMPING.**

**QUICK  
SET-UPS**

**MODEL 25  
HI-DUTY  
MARKING  
MACHINE**

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

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**Booth D-311**

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**Booth D-146**

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**BRADLEY WASHFOUNTAIN CO.**  
Milwaukee, Wis.

**Booth C-625**

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Hoboken, N. J.

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**BRIDGEPORT BRASS CO.**  
Bridgeport, Conn.

**Booth A-315**

**BRIGGS MANUFACTURING CO.**  
Cleveland

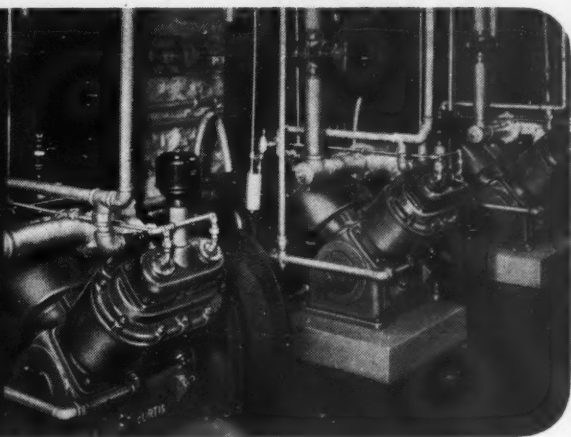
**Booth D-640**

C. H. Kuschel, plant manager; R. Moore, assistant manager and sales manager; N. B. Barnard, sales engineer; J. Faber, Jr., product engineer; V. C. Shaw, superintendent; J. R. Vance, cost accounting; P. J. Meifert, purchasing agent; Phillips, chief draftsman; M. C. Brown, J. Gatt, material control; W. S. Becker, production scheduling; W. J. Driscoll, maintenance; T. Force, personnel manager; Hunter.



# Proof of CURTIS Dependability -

**5 Years of  
24-Hour  
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at Carter  
Carburetor  
Corporation**



Installed in 1936 at the St. Louis Plant of Carter Carburetor Corporation, the three Curtis Air Compressors shown above were on almost continuous 24-hour duty for five years. During this period, they operated at 80 lb. pressure, providing air for the entire plant.

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Curtis Compressors are available in capacities up to 300 cfm. For proof of their efficiency and operating advantages, send the coupon for full information and free booklet, "How Air Is Being Used in Your Industry."

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CURTIS PNEUMATIC MACHINERY DIVISION

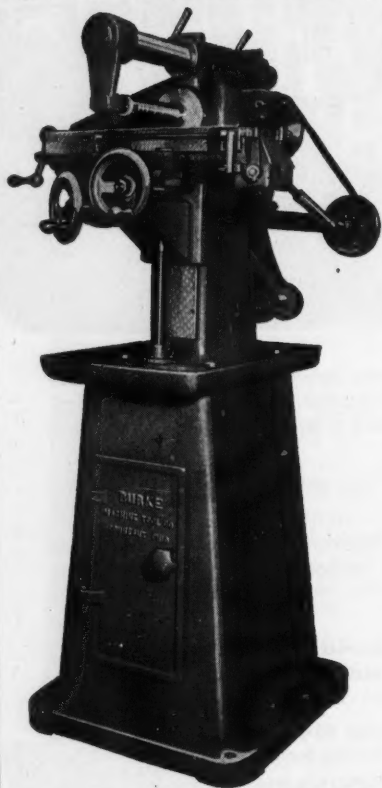
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Please send me booklet, "How Air Is Being Used in Your Industry."

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City..... State.....



# BURKE MILLING MACHINES



**No. 4 Motor Driven MILLING MACHINE  
Mounted on Cabinet Column**

Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

*Write for complete information.*

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## BROWN INSTRUMENT CO.

Division of Minneapolis-Honeywell Regulator Co.  
Philadelphia

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Cleveland

**Booth E-619**

Blair Foulds, commercial engineering manager; Jesse Johnson, sales manager; C. Novorska, field service engineer; Neuman Fayerweather, sales engineer; Harry Sauer, engineer; Robert Matheson, sales engineer; James Brickenden, sales engineer; John Bodnar, sales engineer; William Sutton, advertising manager.

## BUDD INDUCTION HEATING, INC.

Detroit

**Booth D-320**

H. E. Somes, Sr., chief engineer; E. Mainzinger, manager of sales; David Deenport, Budd Wheel Co.; A. H. Ehle, Budd Mfg. Co.

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Chicago

**Booth E-133**

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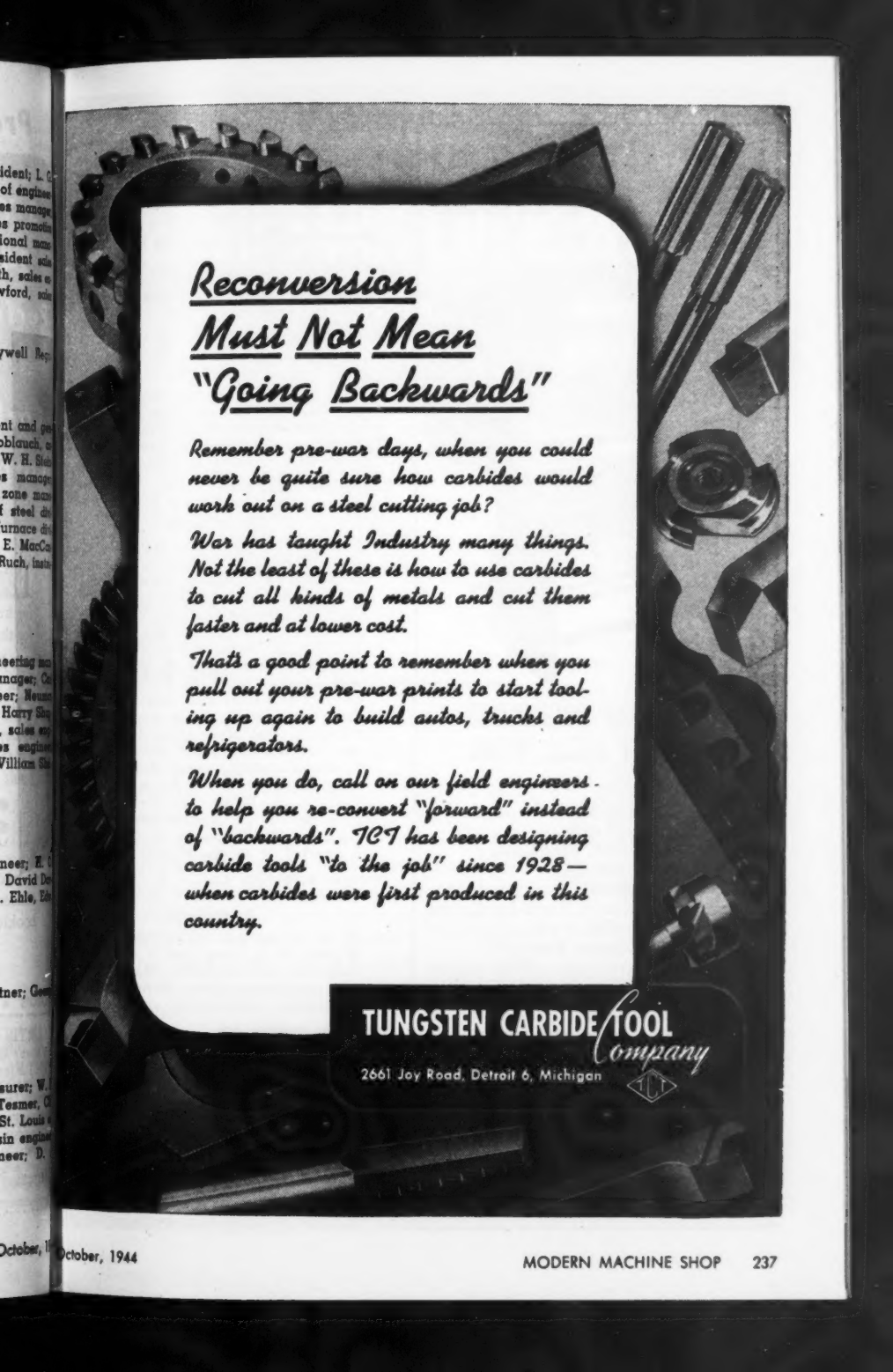
Chicago

**Booth D-601**

J. E. Veihl, secretary and treasurer; W. J. Tesmer, chief engineer; T. P. Tesmer, Chicago engineer; E. H. Perkins, St. Louis engineer; D. C. Scheele, Wisconsin engineer; T. J. Ryan, Cincinnati engineer; D. Jacobson, Michigan engineer.

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## Reconversion Must Not Mean "Going Backwards"

*Remember pre-war days, when you could never be quite sure how carbides would work out on a steel cutting job?*

*War has taught Industry many things. Not the least of these is how to use carbides to cut all kinds of metals and cut them faster and at lower cost.*

*That's a good point to remember when you pull out your pre-war prints to start tooling up again to build autos, trucks and refrigerators.*

*When you do, call on our field engineers to help you re-convert "forward" instead of "backwards". TCT has been designing carbide tools "to the job" since 1928—when carbides were first produced in this country.*

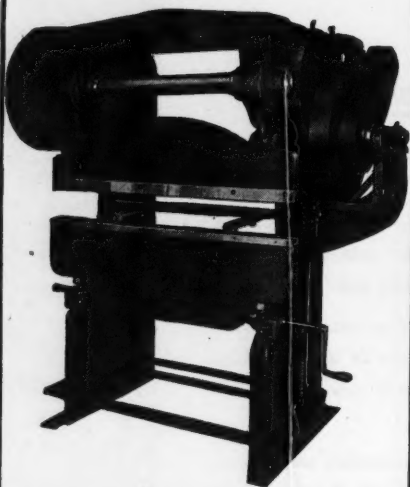
**TUNGSTEN CARBIDE TOOL**  
*Company*

2661 Joy Road, Detroit 6, Michigan



# CHICAGO STEEL PRESS

No. 253



## SPEED WAR PRODUCTION OF SHEET METAL WORK

USE FOR...

1. FORMING
2. EMBOSING
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of Ammunition Cases, Bomb Box Liners, Bomb Fins, Aircraft Parts and Many Other Offense Products.

The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials. Sizes 4, 5 and 6 ft. capacities up to 10 gauge.

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Company**

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Booth D-321

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New York City

Booth G-628

Joseph S. Harris, technician; Daniel Bobrow, sales department.

### CARBOLOY COMPANY, INC.

Detroit

Booth E-604

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### CARPENTER STEEL CO.

Reading, Pa.

Booth D-102

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### CENTRAL SCIENTIFIC CO.

Chicago

Booth P-523

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### CHEMICAL RUBBER CO.

Cleveland

Booth A-310

O. A. Behrend, sales manager; L. J. M. Slay, assistant sales manager; W. E. Slay, sales engineer; F. C. Hays, sales engineer.

### CHERRY RIVET CO.

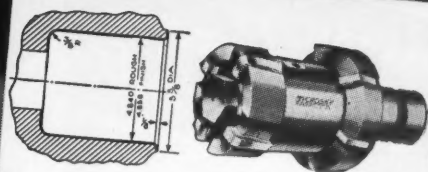
Los Angeles

Booth C-242

Arthur H. Baier, Ohio, representative; H. Stau, chief service engineer.

# MCCROSKY'S *exclusive* patented JACK-LOCK WEDGE

*Produces standard and special tools that  
are strong and rugged...yet easily  
adjusted, reground, rebladed*



Multiple Operation Tool for Facing,  
Chamfering, and Boring Hole with  
Radius in Bottom

The shape, simplicity and small size of McCrosky's Jack-Lock Wedge makes it particularly suited for mounting multiple blades in small space.

When tightened—see view above—the screw bears against the bottom of the recess—raising the wedge—like Jack-Locking the blade rigidly in the tool body. With the Jack-Lock—multiple blade tools attain the strength and rigidity of solid tools—yet release of the blades for adjustment, regrounding or replacement is quick and easy.

Specify McCrosky—leader for 40 years—for "standard," or "special" inserted blade tools that do 3, 4, 5 or even more operations *at the same time*, increasing production, and cutting costs.

Catalog 16-M describes  
McCrosky standard  
Jack-Lock Tools



Catalog 17 describes  
McCrosky Multiple operation  
"Special" Jack-Lock Tools.

**COST  
CUTTING  
TOOLS**

## MCCROSKY TOOL CORPORATION

MEADVILLE, PA.

*Designers and Manufacturers of*  
Jack-Lock MILLING CUTTERS      Block Type BORING BARS  
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Super Adjustable REAMERS      Turret TOOL POSTS



USE THE *Right* FILE

USE THE FILE *Right*

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• Every file is not an all-purpose file. The nature of the work determines the most efficient file to use. Choose carefully the correct type, shape and size for *your* use. Speeds will vary with the job—the smaller the file the higher the speed. Move the file at an even rate and pressure. The Right file is the Ford file. Send for catalogs. M. A. Ford Mfg. Co., Inc.,—744 W. First Street, Davenport, Iowa.



*The mark of a GOOD file*

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Chicago

Booth A-410

J. H. Mills, manager, furnace division

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Booth L-102

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#### CITIES SERVICE OIL COMPANIES

New York and Chicago

Booth F-629

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Beverly Hills, Calif.

Booth K-617

Robert H. Clark; Lon L. Lenzi, manager tool division; W. C. Robinson and W. Hemenway, field engineers.

#### CLARK EQUIPMENT CO.

Booth C-221

#### CLARK INSTRUMENT, INC.

Dearborn, Mich.

Booth C-233

C. W. Clark and E. H. Herman, representatives.

#### CLARK TRACTOR

Division of Clark Equipment Co. Battle Creek, Mich.

Booth C-221

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#### CLEAN SERVICE, INC.

Cleveland

Booth A-624

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## A Centered EYE in 1 Operation

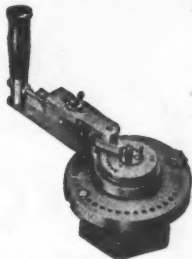
The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at a high rate of production. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

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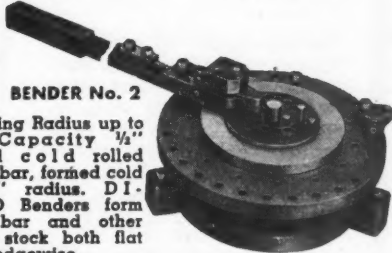
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Forming radius up to 2". Capacity 7/32" round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action, right or left hand mounting and reversible forming nose.



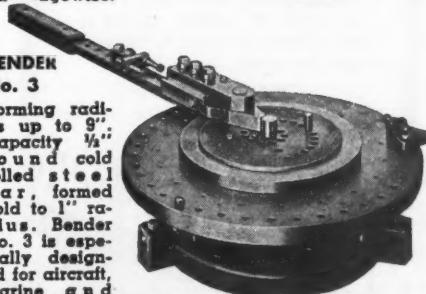
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Forming Radius up to 6". Capacity 1/4" round cold rolled steel bar, formed cold to 1" radius. DI-ACRO Benders form bus bar and other strip stock both flat and edgewise.



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Forming radius up to 9". Capacity 1/2" round cold rolled steel bar, formed cold to 1" radius. Bender No. 3 is especially designed for aircraft, marine and other large radius bending.



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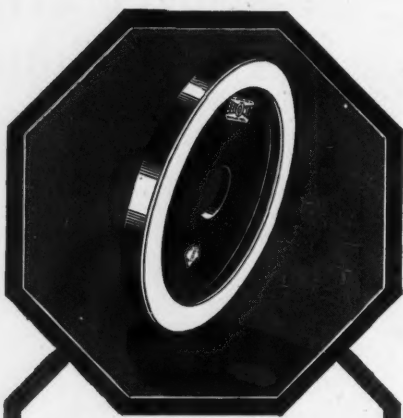
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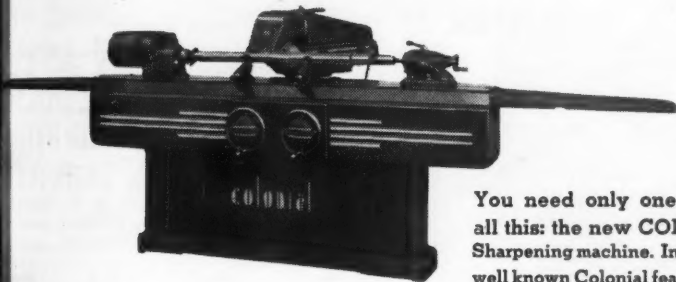
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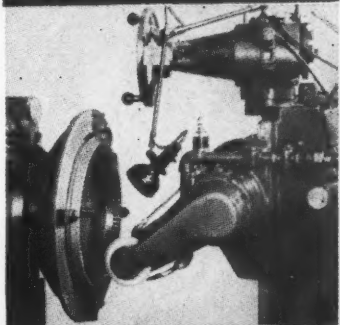
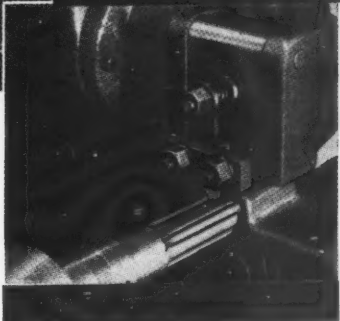
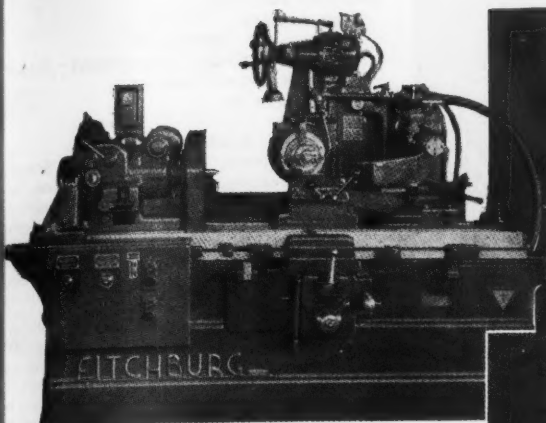
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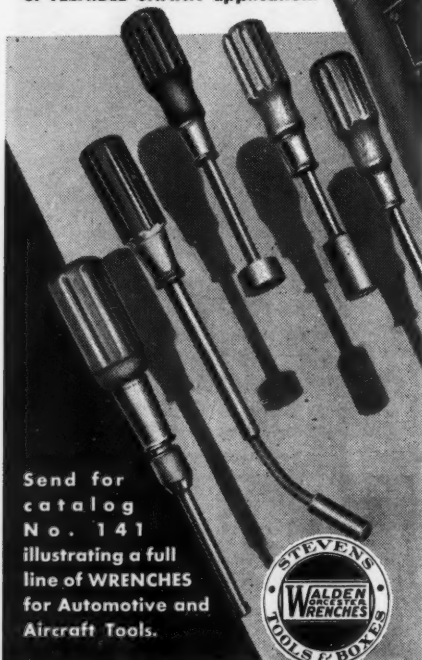
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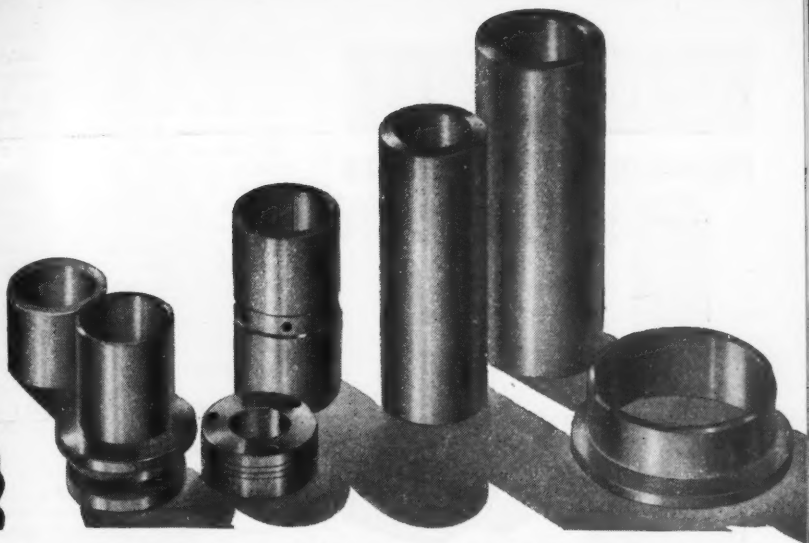
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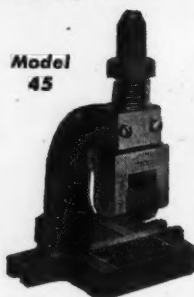
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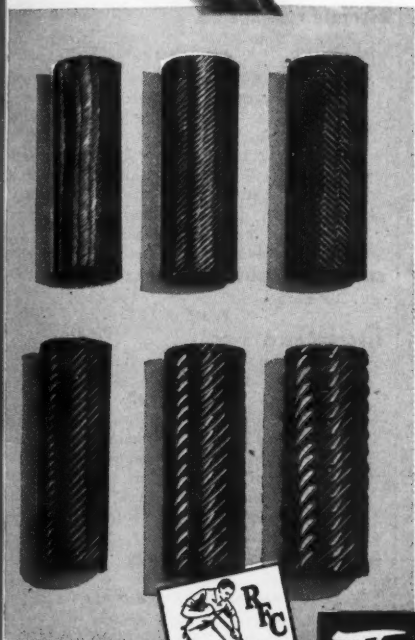


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**ELECTRIC PRODUCTION MAGAZINE**

Cleveland

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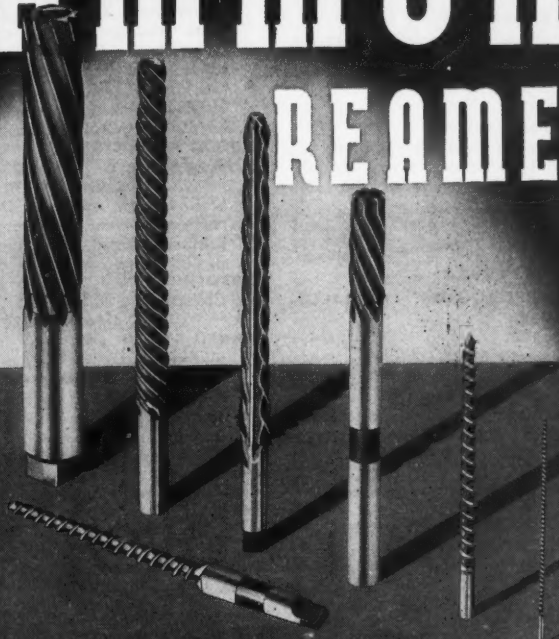
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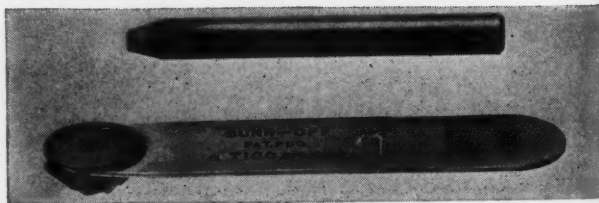
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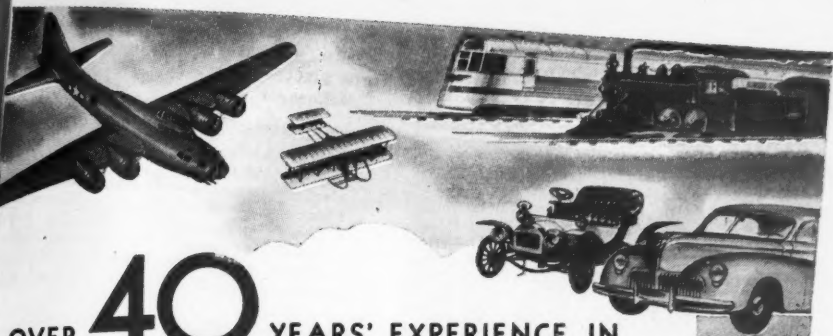
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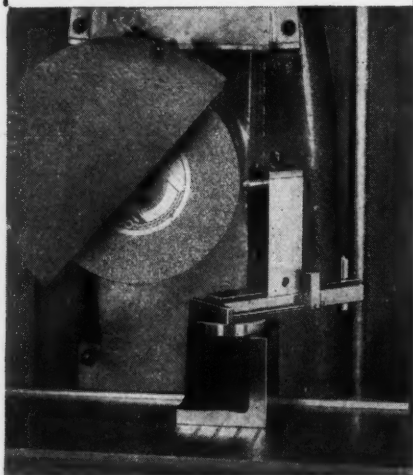
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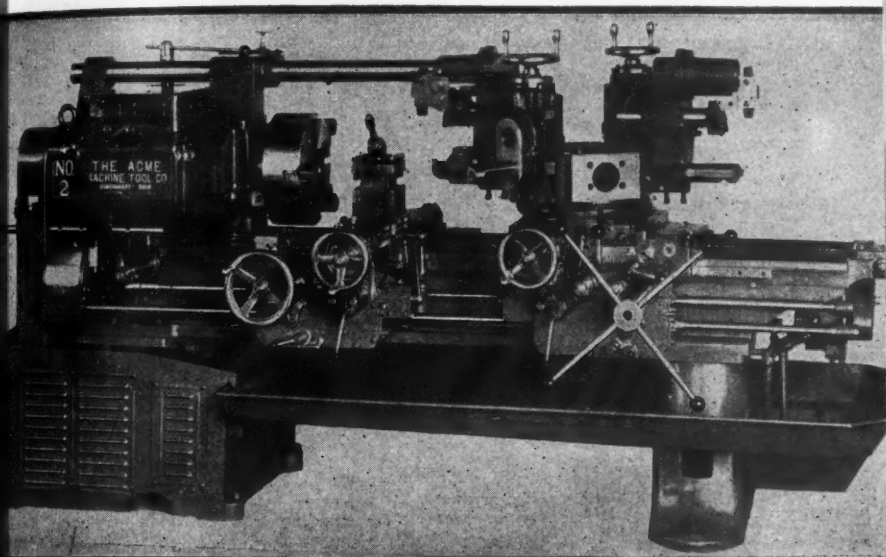
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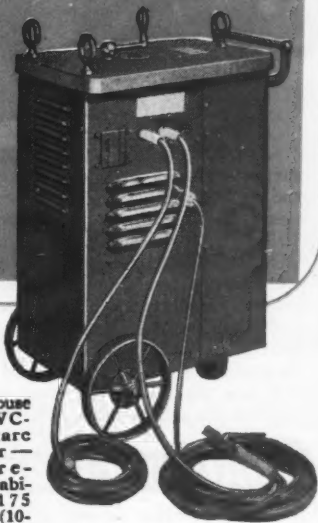
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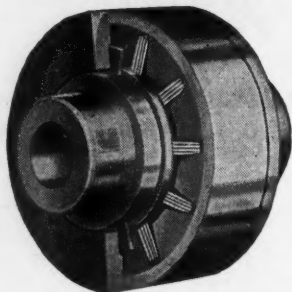
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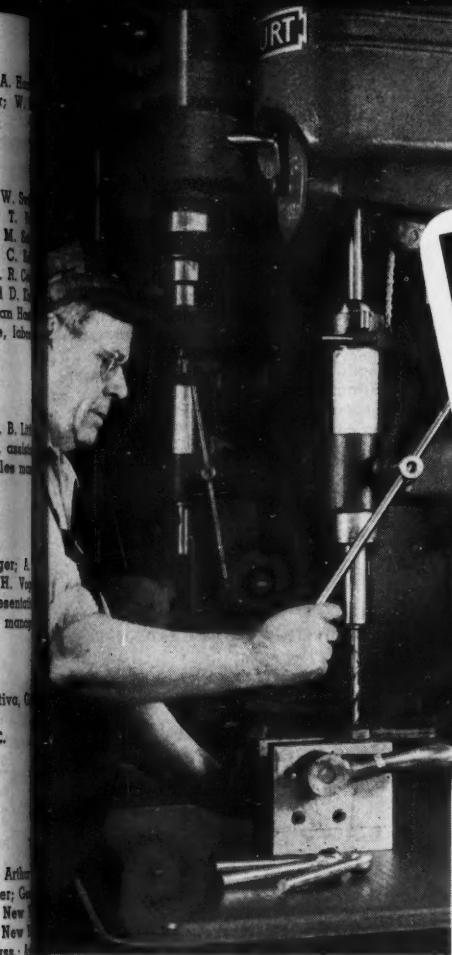
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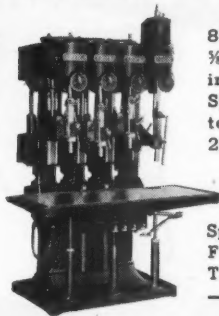
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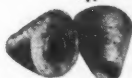
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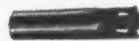
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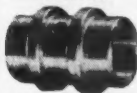
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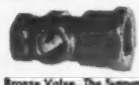
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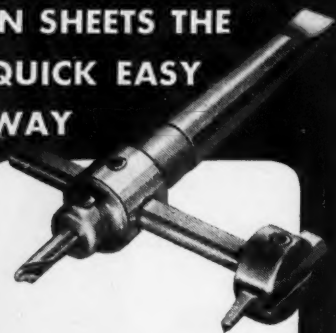
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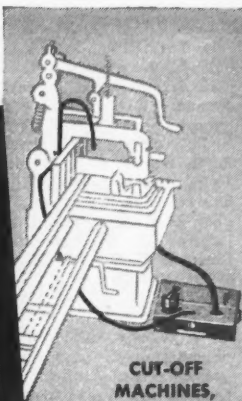
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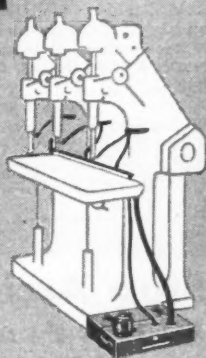
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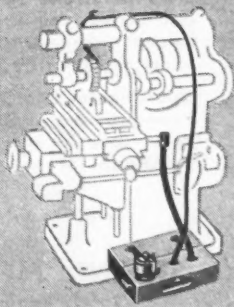
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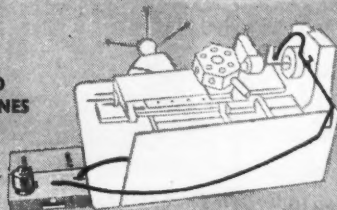


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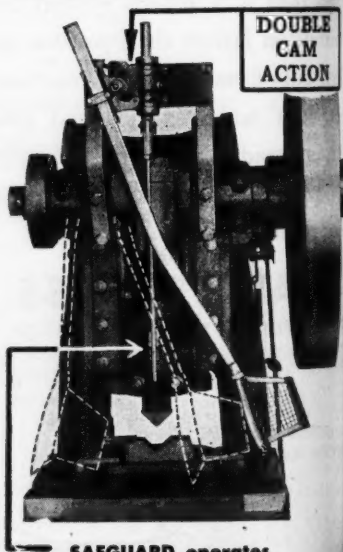
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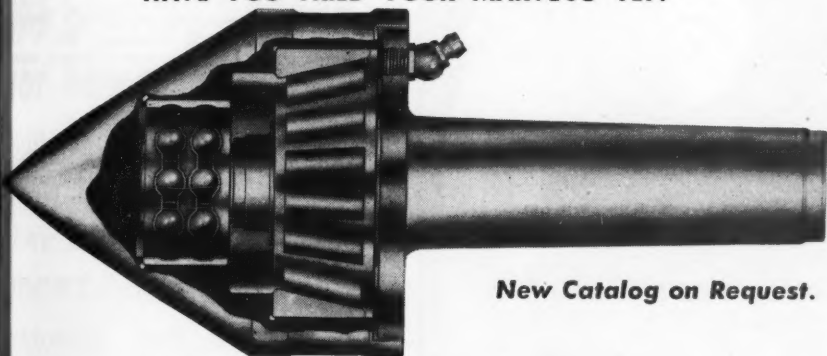


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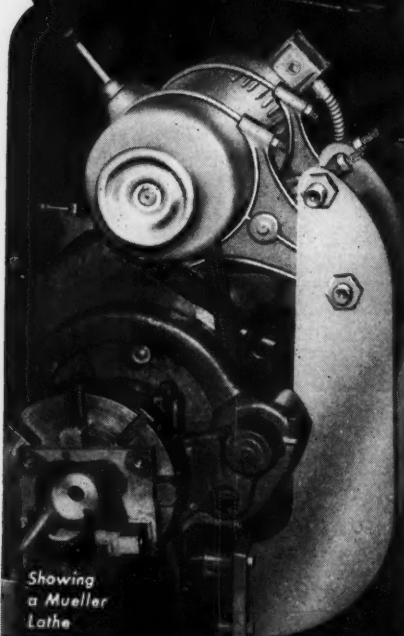
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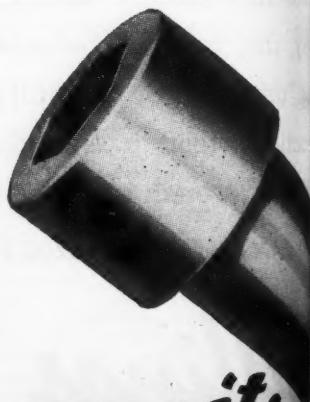
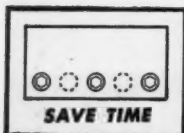
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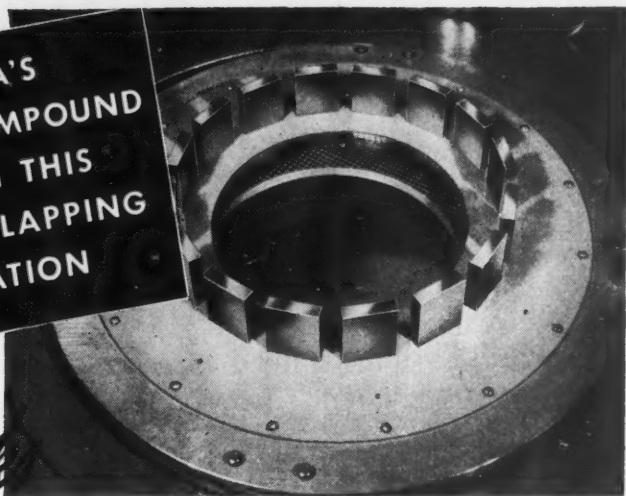


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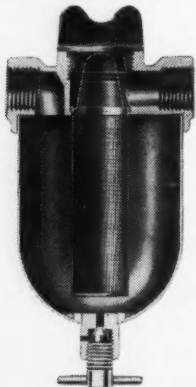


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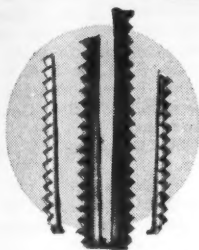
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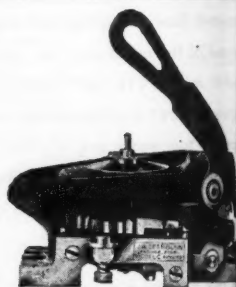
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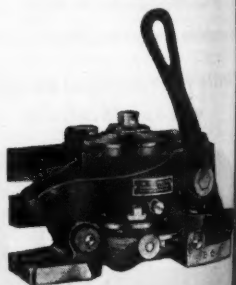
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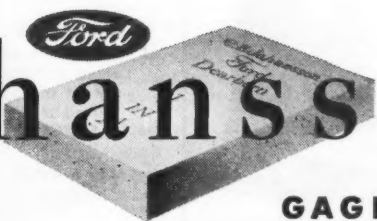
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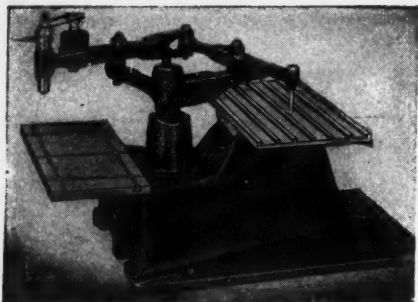
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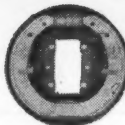
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### AIR CYLINDER

Converts the energy contained in compressed air into mechanical force.



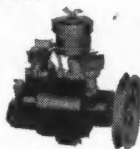
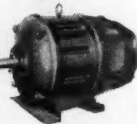
### HYDRAULIC ACTUATOR CYLINDER

Transforms the hydraulic-fluid pressure into mechanical force.



### MOTOR and BRAKE UNIT

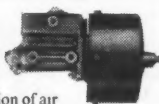
Each unit is equipped with an internal expanding shoe-type brake that is applied by hydraulic pressure developed in a foot-operated master-cylinder.



### AIR COMPRESSOR

The function of this unit is to develop and maintain sufficient compressed air to operate the air-brake system and other air-powered accessories.

**POWER  
CLUSTER**  
Simplifies the application of air power to hydraulic brake systems.



### TYPE HM BRAKE

For use on overhead cranes, whirler-cranes, coke-pushers, lorry-cars, door-machines, and transfer-cars, which require a parking brake when out of service or while performing their principal functions.



Foot-controlled master-cylinder

**TELL US YOUR PROBLEMS**

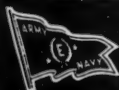
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ESTABLISHED 1891

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**ELECTRICAL AND AUTOMOTIVE PRODUCTS**



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Detroit

**Booth H-628**

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**MICHIGAN STEEL CASTING CO., FABRICATED PRODUCTS DIVISION**  
Detroit

**Booth C-226**

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Detroit

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Cleveland

**Booth F-610**

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**MID-CONTINENT METAL PRODUCTS CO.**  
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**MIDLAND PAINT & VARNISH CO.**  
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**Booth B-210**

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**MILL & FACTORY**

**Booth D-629**

**MINNEAPOLIS-HONEYWELL REGULATOR CO.**

**Booth F-601**

**MINE SAFETY APPLIANCES CO.**  
Pittsburgh

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**BRADY-PENROD MODEL 7500**  
Centrifugal coolant pump and tank—a neat, compact unit highly suitable for use where abrasives are a factor.

Good pumps PAY. Buy the kind used as *standard equipment by many leading machine tool manufacturers*—BRADY-PENROD. Model 7500, shown above, is one of a complete line designed to meet every need. It handles all coolant liquids—kerosene, solubles, light and medium oils, etc., 4 to 100 g.p.m. Tank sizes, 6, 15, 30 gal. or larger, with as many hoses and nozzles as required. Discharge pipe is cast integral with pump and brought to outside of tank. The hinged cover allows cleaning without disconnecting return line.

*Brady-Penrod*

Incorporated

525 E. Eighteenth St., Muncie, Indiana, U. S. A.  
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ALL BRADY-PENROD pumps are heavy-duty and constructed to meet NEEMA standards to 1 H.P. and over, plus.



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More and more applications are being found every day for this advanced machining method that works an entire area at once, that produces final finish while taking the cut, that eliminates heat, dust, distortion, discoloring, fracturing. Wet-Belt surfacing is amazingly fast—5 to 25 times faster than previous methods. It is simpler—often eliminates need for jigs, as well as set-up and lock-up time. It is so accurate that tolerances of .0005" can be held when desired. It enables inexperienced workers to get increased production and superior finish. It can handle many operations now performed on grinders, millers, shapers, planers. It supplements other machines to step-up production, reduce costs, and improve results.

The Porter-Cable Wet-Belt Surfer has been a revelation in many shops. Learn more about it. Send for our new booklet, which is virtually a text-book on the subject. Fill in and mail the coupon right away.

## PORTER CABLE MACHINE COMPANY

**PORTER-CABLE MACHINE CO.,  
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Mail me free booklet, "A New Precision Machining Method."

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Company ..... Position .....

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## MILWAUKEE SURFACE PLATES



36" x 48" . . . semi-steel . . . accurately machined. Securely mounted cast legs are machined and provided with adjusting screws for perfect alignment. Shipping weight, 1300 lbs. Also larger or smaller plates with planed or scraped surface. We also manufacture angles and parallels as shown underneath surface plate.

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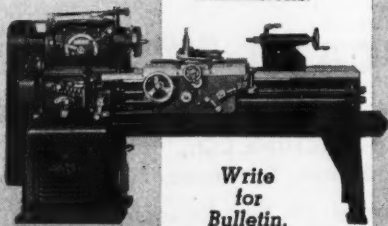
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Engineers and Machinists Since 1907  
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Head Motor Drive  
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Modern Design—  
Liberal  
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MACHINE TOOL CO.

CLEVELAND, OHIO, U. S. A.

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### MOLYBDENUM CORP. OF AMERICA Pittsburgh

Booth D-137

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### MORRISON ENGINEERING CORP. Cleveland

Booth 404

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### MOTCH & MERRYWEATHER MACHINERY CO. Cleveland, Ohio

Booth C-621

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### MOTOR PRODUCTS CORP., DEEPFREEZE DIVISION North Chicago, Ill.

Booth A-402

Howard R. Roberts, general sales manager; E. Lynn Werner, advertising manager; R. E. Peterson, metallurgist; Fred W. comb, field engineer; M. R. Crockett, advertising account executive; Clara F. Cleveland, engineer; Erwin Maus, D. Hanna, Cleveland distributors.

### NATIONAL ENGINEERING CO. Chicago

Booth D-133

Fred W. Fuller, field engineer for Elwood A. Peterson, assistant sales manager; Bryon Ellis, laboratory technician.

### NATIONAL INDUSTRIAL PUBLISHING CO. Pittsburgh

Booth S-130

# NICHOLSON E-x-p-a-n-d-i-n-g MANDRELS

**Solve the Problem of Handling a Maximum of Bores with a Minimum of Mandrels . . .**



TYPE	Size No.	Range of Bores Taken	Net Price
<b>A</b>	1A	1/4" to 1"	\$12.00
	2A	1" to 1 1/2"	16.00
	3A	1 1/2" to 2"	23.00
	4A	2" to 3"	34.00
	5A	3" to 4"	40.00



TYPE A MANDRELS are recommended for a large range of bores with few mandrels. Only five mandrels, each with one set of three jaws, hold work with all bores from 1/4" to 4". No. 1A has jaws with three steps, larger sizes have jaws with two steps. Can be used in hexagonal broached holes as well as round.

Write for Bulletin 1043.

**W. H. NICHOLSON & CO., 136 Oregon St., Wilkes-Barre, Pa.**

## TYPE B—STRAIGHT JAW DESIGN

Size No.	Range of Bores Taken	Net Price
1X	1/8" to 1 1/8"	\$10.00
2X	1 1/8" to 2 1/32"	11.00
3X	2 1/32" to 3 1/4"	12.00
00	3 1/4" to 4 1/8"	14.00
0	4 1/8" to 5"	16.00
1	5" to 5 1/4"	18.00
2	5 1/4" to 6 1/8"	21.00
3	6 1/8" to 7"	29.00
4	7" to 8 1/2"	40.00

### Other Sizes Taking Up to 7" Bores

TYPE B MANDRELS have longer jaw gripping surface, and accommodate longer, heavier work. 14 sizes will accommodate all bores from 1/8" to 7". The smaller sizes require only one set of jaws, intermediate sizes two sets, and larger sizes three sets. Each set consists of four jaws. For square holes as well as round.

## WHITNEY-JENSEN PRODUCTS 10 YEARS EXPERIENCE

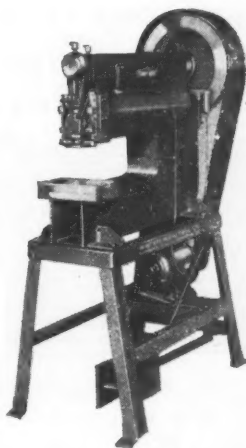
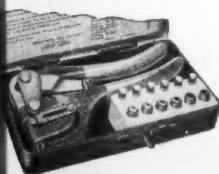
### Punch Presses

**CAPACITY 10 TON  
12" and 18" THROAT  
DEPTHS**

Economical machine for powerful, accurate, durable service. Length of stroke 1 1/4", stroke adjustment 1 3/4", space 6". Welded steel frame and welded angle iron and. Flywheel at rear, out of way of work. Built in motor drive and push button control.

### No. 5 Jr. PUNCH

In handy metal kit box with holder for six extra punches and dies. Thougths in daily use the world over. Capacity, 1/4" hole in 16 gauge iron, punches in center of 4" disc. Double-duty depth gage.



**WHITNEY METAL TOOL COMPANY**  
110 FORBES ST. • ROCKFORD, ILL.

MODERN MACHINE SHOP 279

**NATIONAL MACHINE GAS BURNER**

Division of Mid-Continent Metal Products Co.  
Chicago

**Booth E-609**

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**Booth P-502**

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**Booth E-146**

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**Booth B-222**

**NORTH AMERICAN MANUFACTURING CO.**

Cleveland

**Booth C-320**

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**NORTH AMERICAN PHILIPS CO., INC.**

New York City

**Booth J-605**

**NOX-RUST CORP.**

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**Booth H-625**

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**Booth E-134**

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**OHIO CARBON CO.**

Cleveland

**Booth G-603**

**OHIO CRANKSHAFT CO.**

Cleveland

**Booth A-340**

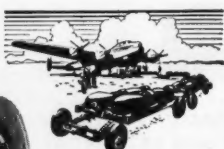
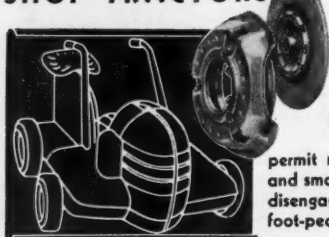
W. C. Dunn, president; F. S. Dunn, secretary-treasurer; W. E. Benning, manager; A. O. Wood, chief engineer; B. Osborn, research director; M. A. T. chief metallurgist; L. C. Schweitzer, Chicago district manager; K. Stumpf, England manager; H. Swartley, New York manager; R. Rolf, Cleveland manager.

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Springfield and Lima, Ohio

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## HOW BOMB TRAIN Power Control HAS IMPROVED The Clutches In SHOP TRACTORS



## ROCKFORD Spring Loaded CLUTCHES

permit most convenient control and smooth gear changes—with disengagement maintained by foot-pedal or hand-lever pressure.

### SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION CONTROL

It tells and shows how **ROCKFORD CLUTCH** and **POWER TAKE-OFF** applications are saving time, power money in tractor operation and a wide range of industries. Give capacities, dimensions specifications.

### Rockford Drilling Machine Division

Borg-Warner Corporation  
300 Catherine Street, Rockford, Ill.

USE ROCKFORD INDUSTRIAL CLUTCHES FOR SUPERIOR PERFORMANCE AND ECONOMY

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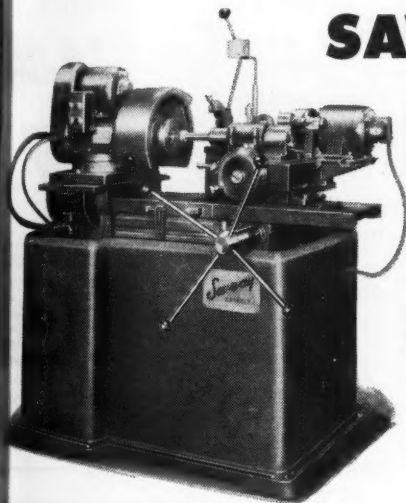
Power Tools



Pullmore Multiple-Disc Clutches • Over-Center and Spring-Loaded Clutches • Power Take-Off

Only 30 of these Slightly Used

## SAV-WAY HAND INTERNAL GRINDERS



CEILING PRICE \$4,970.00  
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COLLECT  
FOR  
ACTUAL  
PHOTOS  
AND  
SPECIFICATIONS

- ★ No Priority Needed
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• Machine Tool Division •

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## Alnor PYROCON

the contact pyrometer for quick accurate surface temperatures.

This convenient, all-purpose surface temperature pyrometer is ideally suited to a variety of industrial plant needs. Accurate temperature readings are obtained in a few seconds, of plastics, liquids, oils, and similar materials, and of flat or curved, stationary or moving surfaces.

Built in several standard ranges, 0-300 deg. F., to 0-1200 deg. F. Write for Bulletin 3511 giving complete description.

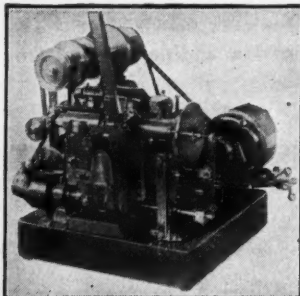
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with revolving cutter will make 2 or 3 successive cuts for watch pinions or may be used for fine pitch gears up to 1 1/2" dia. Revolving cutter makes successive cuts on blanks held and indexed by work spindle and usually supported by a tail center. Only straight teeth can be cut. Write for Bulletin No. 112.

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**OMEGA RESEARCH LABORATORY, INC.**  
Detroit

**Booth G-610**

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Minneapolis

**Booth C-640**

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Chicago

**Booth D-626**

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Cleveland

**Booth B-618**

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**OWENS-CORNING-FIBERGLAS CORP.**  
Toledo, Ohio

**Booth B-214**

**OSALID PRODUCTS DIVISION**  
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**Booth B-209**

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Hagerstown, Md.

**Booth A-611**

**PARK CHEMICAL CO.**  
Detroit

**Booth D-141**

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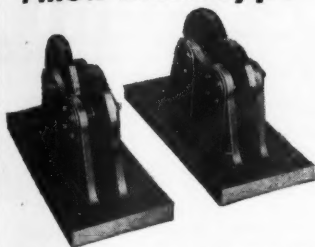
**PARKER APPLIANCE CO.**  
Cleveland

**Booth B-604**

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## ANDERSON BALANCING WAYS Pillow Block Type



A sub base can be made of proper height to give necessary clearance for large diameter work.  
Supersensitive ball bearings and hardened and ground spindles assure accuracy.

Write for details.

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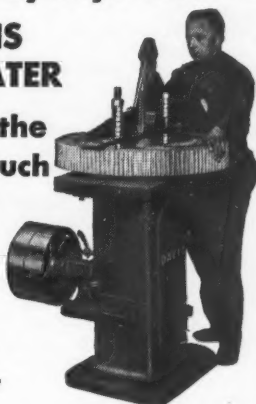
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### DAVIS KEYSEATER

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quicker  
and  
better?

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for  
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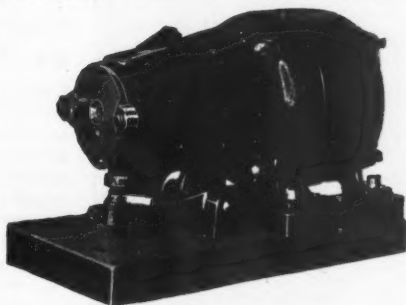
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That's what the PRECISION WIRE STRIPPER is doing today for hundreds of war production plants throughout the U. S.—AND IT WILL DO THE SAME THING FOR YOU if wire stripping problems now confront you.

In a twinkling, this ruggedly built precision instrument removes insulation from the ends of solid, stranded or multi-conductor cable and wire up to a half inch in diameter AND IT DOESN'T REQUIRE A SKILLED OPERATOR.



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Cleveland

**Booth E-146**

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Chicago

**Booth P-530**

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**PHYSICISTS RESEARCH CO.**

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New York City

**Booth G-617**

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**PINES ENGINEERING COMPANY, INC.**  
Aurora, Ill.

**Booth F-620**

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**POOR & CO.**

**Booth C-428**

**PORTER-CABLE MACHINE CO.**  
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**Booth L-103**

Cliff Stewart, district sales representative, Cleveland; H. A. Kimball, Columbus representative; William Stellhorn, Toledo representative; J. M. Smith, Detroit representative.



**CIRCLE CUTTING ATTACHMENT**  
Included as Standard Equipment  
With This Machine

3-H-43

## Cuts...inside or outside...straight or curved...flat sheets or formed work

Even an unskilled operator can follow a scribed line, easily and rapidly. Shears flat or formed sheet metal, internal or external, plain or irregular shapes. Vision is unobstructed; both hands are free to guide work at all times. No resistance to feeding or turning. Action of cutters does not "feed" material. *Write for Bulletin.*

Made in sizes up to 60-in. throat, 10-gauge capacity

**Cleaner, smoother edges  
...need no finishing**

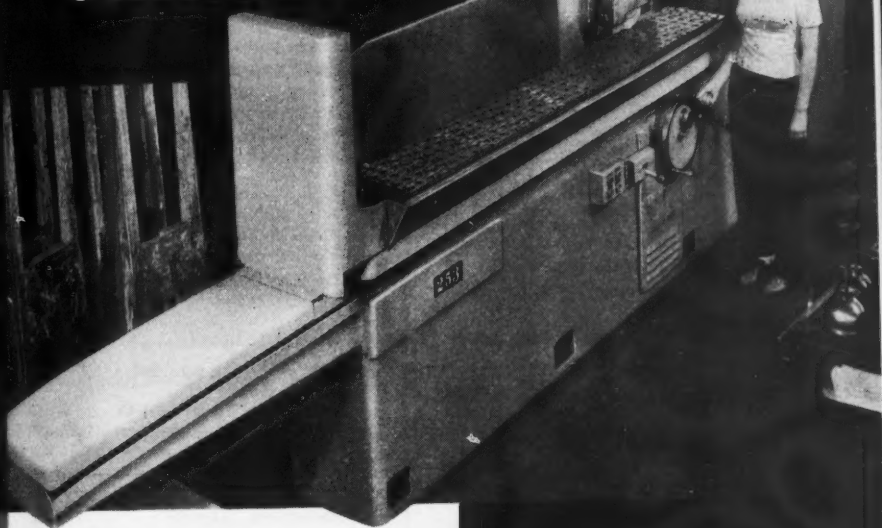
# Libert Hi-Speed SHEAR

**LIBERT MACHINE COMPANY, GREEN BAY, WIS.**

# GRINDING

*small forgings  
from the rough on a*

# THOMPSON GRINDER



• Due to the higher feeds and speeds and the use of harder, open, free cutting wheels, the Thompson Grinder can grind many parts from the rough faster—without distortion—at less cost.

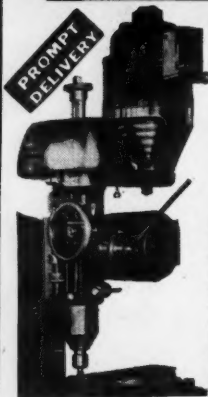
For example on the job shown 90 pieces per hour are ground from the rough. This includes grinding two sides—removal of .075 to .100 inch stock on each grind—and is floor to floor time. Machine is a B-type 12" x 18" x 60".

You can really do a job on a Thompson. Consult a Thompson Engineer on grinding work from the rough—on high production, close tolerance grinding.



— THE **Thompson** GRINDER CO. —  
SPRINGFIELD, OHIO

**MILLING - DRILLING - BORING**  
**ATTACHMENT for Heavy Duty Operations**



**EASY MOUNTING**

**LARGE QUILL—4" TRAVEL**  
 (counter balanced, hardened, and ground)

**6 SPEEDS, 250-3000 RPM.**  
 Lever and Worm Feeds.  
 $\frac{1}{2}$  H.P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes  $\frac{1}{8}$ " to  $\frac{3}{4}$ " end mills. Precision Engineered and Ruggedly Constructed Throughout.

Write for descriptive folder.

**RUSNOK TOOL WORKS**  
 4840 North Avenue, Chicago, Ill.



**Save Time on WAR ORDERS**

with a  
**BEVERLY Throatless Shear**

If you're cutting straights or irregulars on "War" jobs, you can speed 'em up with a BEVERLY. Write for sizes and prices now!

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tive; H. L. Ramsay, sales manager, Syracuse; M. H. Rochelle, Syracuse; Frank Hurd, designing engineer, Syracuse.

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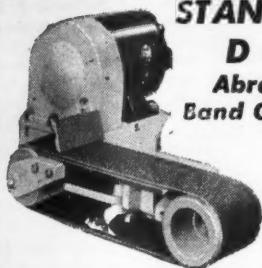
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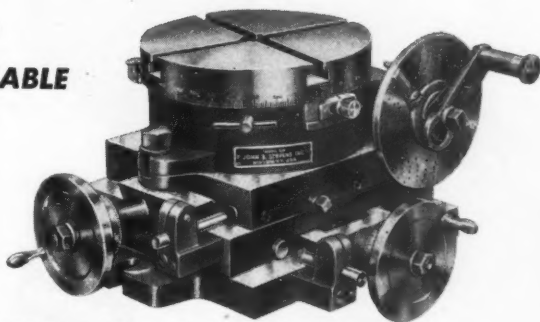
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**Booth H-611**

**RESALE**

**Booth G-629**

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**Booth D-324**

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**REVERE COPPER AND BRASS, INC.**  
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W. G. Seidlitz, plant manager, ordnance division, Chicago, in charge of exhibit; E.

S. Bunn, metallurgical manager, magnesium-aluminum division, Baltimore; E. D'Vileskis, assistant works manager, Delta division, Chicago; R. K. Snively, technical advisor, Baltimore division; L. W. Marshall, assistant sales manager; J. H. Reese, technical advisor; A. B. Two, technical advisor.

**REVISTA INDUSTRIAL**

**Booth E-146**

**REYNOLDS METALS CO.**

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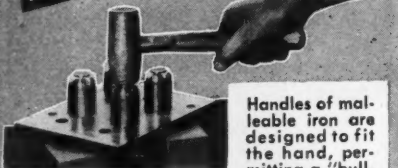
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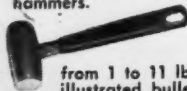
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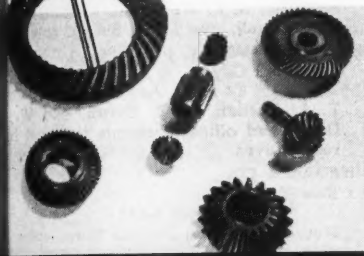
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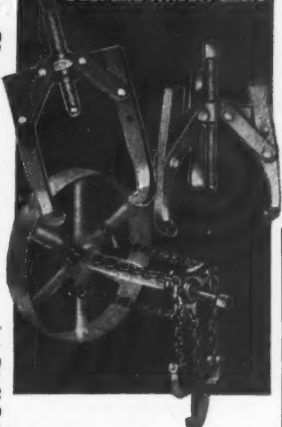
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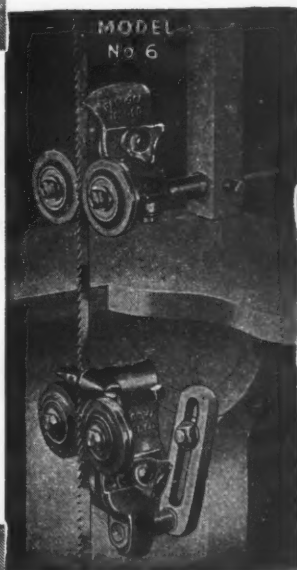
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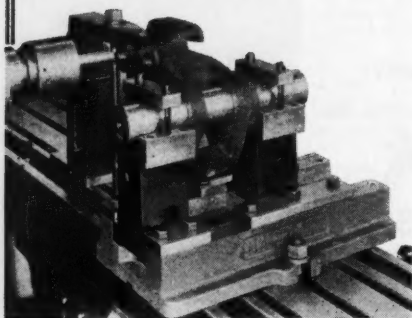
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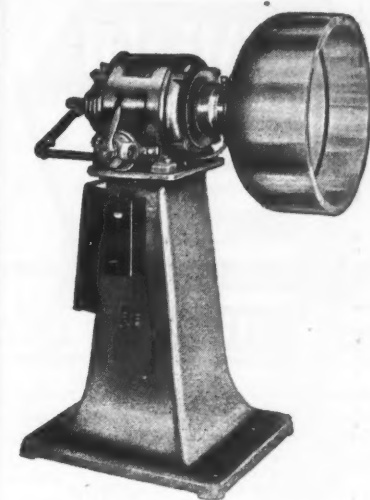
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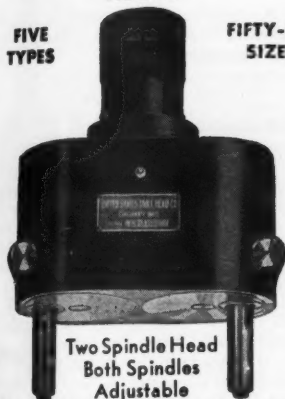


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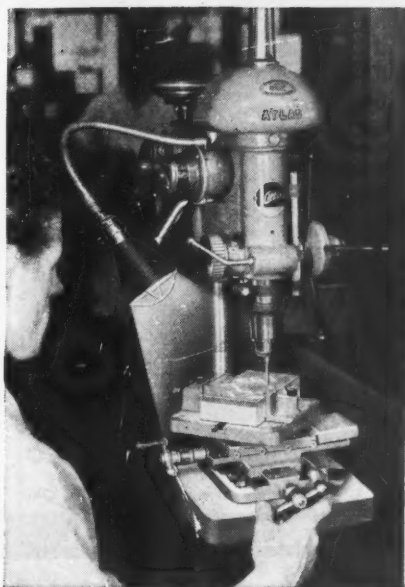
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Stock sizes range from  $\frac{3}{4}$ " to 10" openings, from  $\frac{1}{2}$ " to 16" deep. A complete line in all patterns and sizes.



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Founded in 1879

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## Counterbores High Speed Back Spot Facers Core Drills Flue Sheet Cutters



*Interchangeable  
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Also Specials*

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**Booth B-403**

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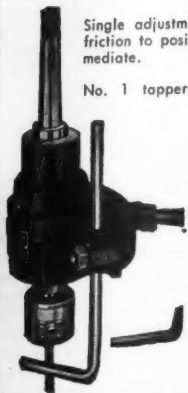
J. B. Carlyon, sales manager; S. S. Brown, Chicago district manager; Allen Brown, Detroit district manager; H. C. Brown, Fava, assistant to president; H. C. Brown, Cincinnati branch manager; W. H. Hayes, Pittsburgh branch manager; C. Huber, Detroit branch manager; H. A. Lawrence, Cleveland branch manager.

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ON ALL SIZES**

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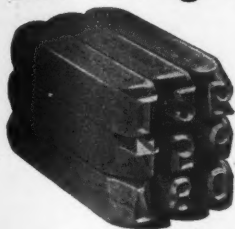
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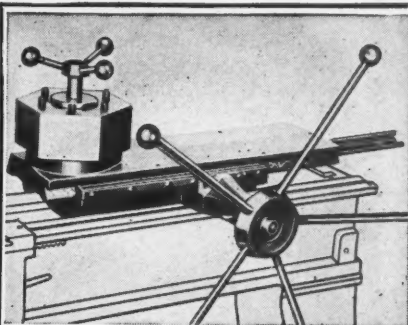
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HEAVY DUTY. Self-Indexing  
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Do turret work on your engine lathes! LYNN turret equipment gives you *immediate conversion*. Easily, quickly mounted on idle or unproductive lathes, enabling them to handle multiple operations rapidly on a wide range of work. Bed Turret models for lathes of all sizes and makes.

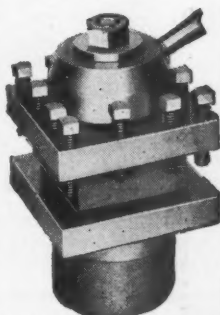
LYNN BT-3 (above), Heavy, Duty, Self-Indexing Bed Turret, for large engine lathes up to 28" swing. 9 1/2" hex head, 10" travel, 6 positions. Equipped with special adjustable base. Also practical for *replacements* on standard turret lathes.

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*Self Indexing    Working Parts Enclosed*

For lathes from 9" to 30" swing. Both tee bolt and bolt circle mounting for all types of screw machine and turret base mountings. Performs 4 separate operations in succession with one setup. Sizes: 3 1/4", 4 1/4", 5 1/4", 6 1/2", 8".

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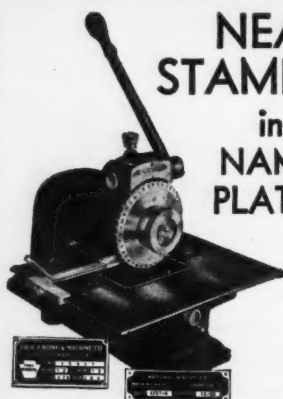


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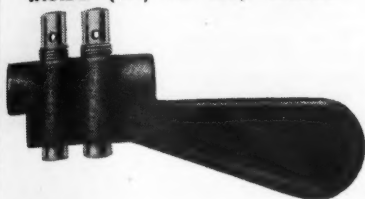
E. R. Clark, manager, filtration division; F. J. Armstrong, chief engineer, filtration division; and C. A. Wallace, C. I. Waller, A. J. Sanders, J. C. Besler, G. C. Benson, W. G. Parry, R. W. Strickland, and J. Schwarzer, filtration division; C. Lee, Jr., sales manager.

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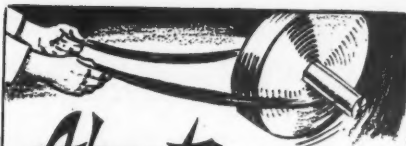
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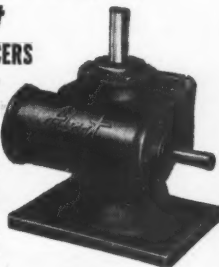
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DIVISION OF J. M. NASH COMPANY

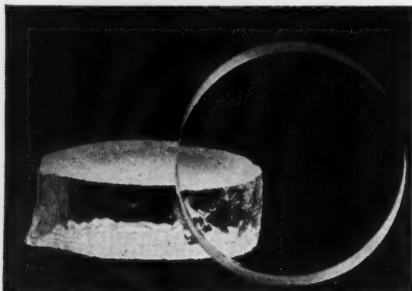
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VAN DER HORST CORP. OF AMERICA  
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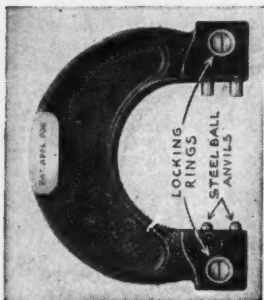
Booth D-329

G. H. Mackenzie, president; T. B. Jefferson, editor; C. B. Clason, associate editor; D. I. Watson, midwest advertising representative; T. E. Depew, eastern advertising representative; R. L. Simon, promotion manager.

WELLMAN CO., S. K.  
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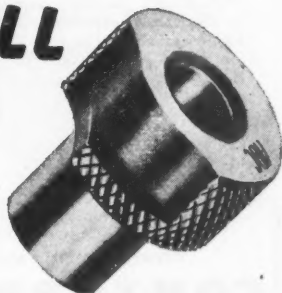
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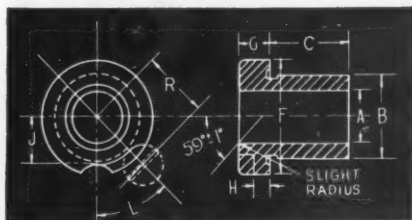
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 Three Rivers, Mich.

**Booth D-611**

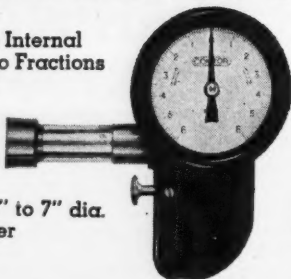
A. E. Armstrong, president; W. F. Wells, vice-president; F. R. Judd, secretary-treasurer; R. W. Bowers, general manager; J. E. Worline, purchasing agent; V. L. Beckle, sales assistant; Eugene VanLoo, Jr., service engineer; Rex Orr, factory service; M. H. Worline F. B. Hagenbuch, George Wells, and A. H. Turnbull, field engineers.

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Precision Internal  
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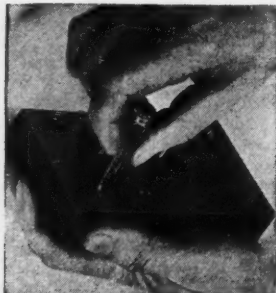
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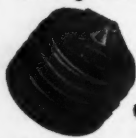
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 Phelps, N. Y.

**Booth B-206**

**WESTERN METALS**  
 Los Angeles

**Booth A-632**

Jay Jenkins, publisher; L. V. Hohl, editor; manager; David Carmen, Midwest manager.

**WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY**  
 East Pittsburgh, Pa.

**Booth B-340**

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**Booth C-229**

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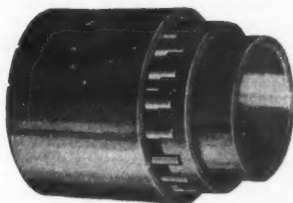
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1840 - 1944

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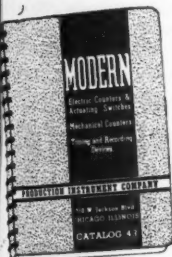
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V. E. Lysaght, sales manager; J. B. Ver-

rier, assistant sales manager; C. H. Thompson, Ohio-Pennsylvania representative; C. W. Smith, Michigan representative; Paul Fee, Illinois representative; J. L. Kavalier, Indiana representative; Floyd Olin, Western New York representative; S. P. Rockwell Co., New England representative; Canadian-Fairbanks Morse Co., Ltd., Canadian representative.

**WOOD PRODUCTS CORP., J. R.**  
New York City

**Booth B-218**

Rawson L. Wood, president; Arthur W. Muller, assistant production manager.

**YALE & TOWNE MFG. CO.**

**Booth A-409**

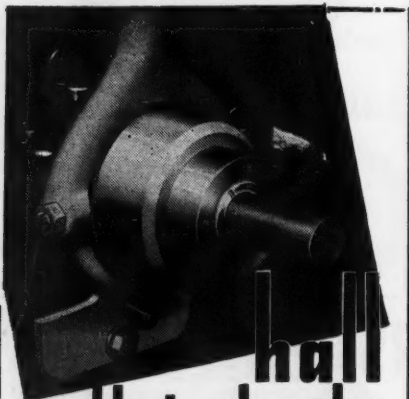
**YERGES MFG. CO.**

**Booth F-633**

**ZAGAR TOOL, INC.**  
Cleveland

**Booth E-628**

Walter Zagar, president; Frank Zagar, vice president; Leslie Korody, sales manager; Edward F. Dain, Cleveland representative; C. A. Reece, advertising manager.



# collet chucks

All grip—no slip... no bearings, friction, heat or lost power... push out type... full spindle capacity or over... automatic adjustment... work re-set without stopping lathe... 2 sizes, 1" and 2" capacities... order now with proper priorities.

*Immediate deliveries.*

**HALL MANUFACTURING COMPANY**  
Ph. NO 9679

622 Tularosa Dr. Los Angeles 26, Cal.

## 150-Seater Aeroplane

A luxury air liner intended to carry 150 passengers from New York to London non-stop was shown recently in model form at Consolidated-Vultee aircraft plant, Texas. The aircraft, which is not to be built until after the war, will carry sufficient fuel reserves to reach alternative airfields in Europe in the event of bad weather.

Known as the Consolidated 37, it has a wing span of over 200 ft., two deck levels, and will be able to make three round trips a week.

Without luxury accommodation it could carry 400 passengers.

*Anglo-American News*



Write for Catalog S-44.  
**THE READY TOOL CO.**

510 IRANISTAN AVE., BRIDGEPORT, CONN.

## SHORT OVERHANG

and preloaded precision bearing assure accuracy at all speeds. Center point runs true and stays true.

## LEACH External Grinder

PRICE  
**\$875.00**  
Fully Equipped

Grinds Work  
from  $\frac{3}{4}$ " to  
11" in length  
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to 7" in diameter.  
Our dealers will  
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EXCELLENT DELIVERIES

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387 CHARLES ST. PROVIDENCE, R. I.  
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## The CRITERION Carbide Tool Grinder

**GREATER  
PRODUCTION  
CAPACITY**

Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third HP balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment: One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

Order from your dealer or write direct. Request literature. No obligation.

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MACHINE WORKS  
BEVERLY HILLS, CALIFORNIA

## Fast WORKER FOR ACCURATE TOOLING JOBS...



Despite the shifting around and changing of machine tools as industry reconverts, the LINLEY Milling and Jig Boring machine will still function as the "trouble shooter" in busy toolrooms. Dies, jigs, models, metal patterns and countless small jobs are handled easily, quickly and at low cost... saving larger machines for their rated duties.

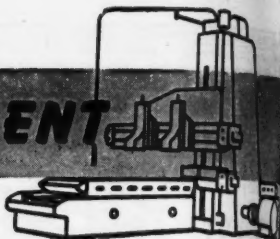
**FEATURES:**  
8 spindle speeds to 4250 r.p.m.; velvet feed, micrometer screw head; grease-sealed bearings; no backlash in quill

travel; ample table size and travel but small floor area ( $18\frac{1}{2}$ " x 20"); fast set-up; easy changeover... a precision machine that earns its keep from the start.

BULLETIN ON REQUEST

**LINLEY BROS.**  
**CO.**  
661 STATE ST. EXTENSION  
BRIDGEPORT 1, CONN.

# NEW SHOP EQUIPMENT



## Colonial Model CS2 Broach Sharpener

The illustration herewith shows the Model CS2 Broach Sharpener now being offered by the Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich. Especially designed for easy operation by women workers, the machine can be used in sharpening round and flat broaches—splined, serrated, and other types—up to 7 feet long and up to 6 inches in diameter and 8 inches in width respectively.

Of particular importance in making broach sharpening easy is the lightweight alloy construction of the sliding head which is supported on and guided by full anti-friction double-row roller bearings that are completely sealed against entry of grinding dust to ensure maintenance of ease of action of the head for the life of the machine.

Available on special order is an arrangement which makes possible the maintaining of identical steps per tooth in regrinding broaches. This arrangement comprises the use of Colonial dual-

ratio micrometer handwheels with which feed can be controlled to ten thousandths of an inch.

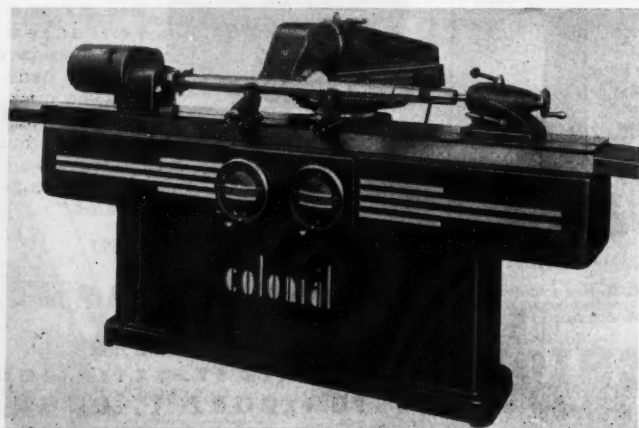
Also available on order is a special roller curtain design for protecting the ways of the machine when the table is moved to one side or the other. On the standard machine, metal guards are provided for this purpose. The roller curtain design permits a reduction of feet in total floor space required when sharpening broaches of maximum length that can be handled on the machine.

Change-over from sharpening round to flat broaches can be accomplished quickly and conveniently without special tools and with few adjustments. Universal positioning and movement of the grinding wheel are obtained by the use of a vertical column, a cross slide mounted on graduated support, and a graduated wheel head mounting.

Headstocks for cylindrical broach sharpening are provided with reduced gearing affording spindle speed of 10 and 400 r. p. m. Tailstocks are equipped with quick-release spring-loaded centers. Barrel type steady rests have con-

points made from round fiber to prevent injury to broaches. Adjustable stops, coil spring cushions are provided for the broach head cross slide guard against shock at the end of the stroke of the head when sharpening flat broaches.

If desired, the Model CS2 can be obtained with a handy pin head and tail



Colonial Model CS2 Broach Sharpener

**M-B** *MODEL SS-SR*



**"SUPER-SPEED" Pneumatic GRINDER**

**A 100,000 R.P.M. UNIT**  
 A powerful, fast-cutting tool, streamlined in design, easy to handle. Designed for real production work and the toughest jobs. Precision made, excellent balance. Special grease-sealed bearings . . . no lubrication required. Fitted with steel housing, a special safety feature. **WRITE FOR CIRCULAR.**

**M-B PRODUCTS**  
 130-134 E. LARNED ST.  
 DETROIT 26, MICHIGAN

**ARMSTRONG-BRAY**  
**STEELGRIP**  
STANDARD BELT LACING



**STEELGRIP BELT LACING**

A strong lacing for all types of belts. Put on with a hammer in a few minutes. Clinches smoothly into belt, compresses ends, prevents fraying. 2-piece hinged rocker pins provided. 11 sizes. In boxes, handy packages, cartons and long lengths.  
*Write for catalog sheets.*

**ARMSTRONG-BRAY & CO.**  
*"The Belt Lacing People"*  
 5346 Northwest Highway, Chicago 30, U.S.A.

**BELT LACING**  
 Both types from 1 source

**BELT HOOKS** come with blue aligning cards that prevent waste—every hook can be used. Protects fingers. Applied with a **WIREGRIP** or any other standard Belt Lacing Machine. 6 sizes.

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**WIREGRIP**  
BELT HOOKS




**INCREASE YOUR METAL CUTTING PRODUCTION**

In selecting hack saws that are needed today on production lines, you will always get results with **GRIFFIN**. The line is complete . . . a blade for every cutting job . . . the quality proven by 63 years of experience.

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*General Sales Agent*  
**105 DUANE ST. NEW YORK CITY**  
 Made by G. W. GRIFFIN CO., Franklin, N. H.

**GRIFFIN**

*Hack Saw Blades*

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Sharpen  
  
October, 1944

# SAFETY

WITH

## Hackmaster

Reg. U. S. Pat. Off.

**UNBREAKABLE HAND BLADE**



**Molybdenum High Speed Steel**

**SAFETY.** Hazards and accidents of sawing are eliminated by the use of these Safety Hand Blades. Inasmuch as these are unbreakable blades they will withstand hard usage, even misuse, without shattering. Sharp twists and kinks, which are the main reason for saw breakage, are absorbed without damaging these blades.

## "LENOX"

**American Saw & Mfg. Co.**  
Springfield, Mass.

stocks, steady rests, and so on, for sharpening flat broaches only. Magnetic chucks for grinding flat broaches are available as extra equipment.

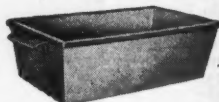
### Michigan "860" Series Rotary Crossed-Axis Gear Finishing Machines

Designated as the "860" Series, an improved line of rotary crossed-axis gear finishing machines is now in production at the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. The line comprises four basic models—the 860 for shaving narrow face and shoulder gears by the "underpass" method; the 860-B for shaving wide face gears by the "transverse" method; the 860-A in which both the "underpass" and "transverse" shaving methods are provided; and the 860-C for shaving of internal gears. The first three models are available in three sizes for shaving gears with maximum O. D. of 8, 12, and 18 inches.

All 860 Series machines utilize Cone-Drive gearing which is said to ensure maintenance of initial operating clearance tolerances over long periods. In addition, with the greater rigidity provided in the machines, motor power has been increased to 2 h. p. to afford a reserve for special jobs. Improved facilities for curve shaving are available as optional equipment on the 860 machines.

Great ease of adjusting reciprocating speeds is afforded on all improved machines. On the 860, 860-B, and 860-C two sets of change gears are provided, one set affording five variations in cutter spindle speed while the other provides five variations in speed of the reciprocating mechanism. On the 860-A

### New Nesting Type Tote Pans



20" long x 12" wide x 6 1/2" deep.  
16 ga., drag holes and handles both ends.

**J. L. LUCAS & SON, INC.**  
Bridgeport, Conn.



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Pans

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ber, 1944 October, 1944



## M-D Facing Heads

### With Automatic Feed

Can be attached to Boring Mill Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically. Sizes 6" to 46" diameter.

Write for circular.

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## DRILL THESE HOLES

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Your business letterhead will bring literature.

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EVERY ONE A "CHAMPION"  
**CHAMPION**

## EXPANDING MANDRELS

Any size hole within a 1" range of infinite variation! That's what one size Champion Expanding Mandrel will completely and accurately handle. The hardened steel flexible sleeve automatically expands to the correct size as it is raised on the tapered arbor. Only 12 champions needed for range from 1/2" to 6 1/2". Eliminates numerous solid mandrel sizes. More convenient. Costs 2/3 less. Proved for years by thousands of shops.

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and Manufacturing Co.  
SPRINGFIELD, OHIO

## SEALED PROTECTION FOR FINE TAPS

Reiff & Nestor Taps now delivered to you sealed in a Moisture Proof, Shock-Resistant, Tough, Plastic jacket that gives the cutting edges the perfect protection fine tools deserve.

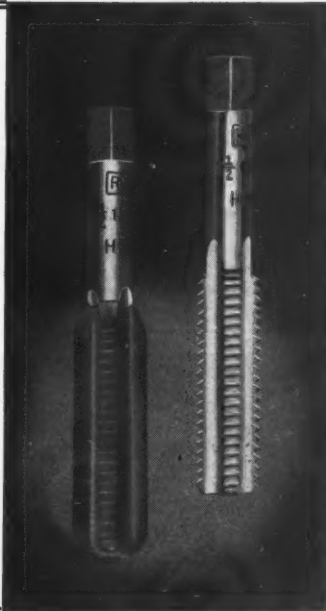
No more chipping in transit or injury from Tool Room handling.

Reiff & Nestor Plastic jacket is easily removed and may be used again and again.

There is no extra charge for this Reiff & Nestor innovation.

The new Reiff & Nestor Catalogue and Tapping Guide — just out. A request on your Letter Head brings it.

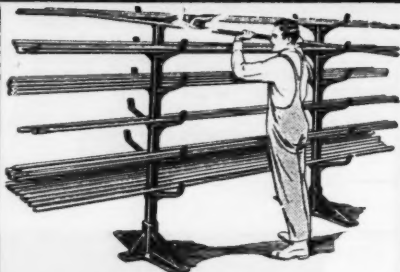
**REIFF & NESTOR CO.**  
LYKENS, PENNA.



on which two optional methods of shaving gears (underpass or transverse) are offered, separate provisions are made for change gears for each of the movements. The design is such, however, that the same actual gears can be used interchangeably for the underpass or transverse change gears. Standard machine equipment includes six gears each for cutter spindle and reciprocation speed changes.

In line with mechanical improvements providing longer service life of the 860 Series machines, these models feature more efficient sealing to further reduce

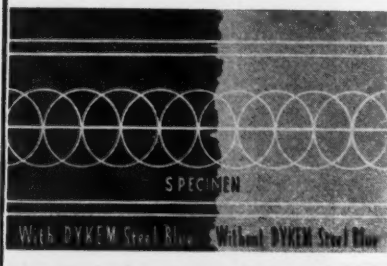
## SAVES TIME IN YOUR STOCK ROOM



The BROWN SECTIONAL RACK saves the time wasted end-hauling stock from the old-style, closed-side rack and quickens the selection of sizes by greater visibility. Built of standard metal sections: can be expanded for changes in stock or growth of business. Made in 5 styles: can't burn, depreciation practically nil.

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**BROWN**  
ENGINEERING CO. 120 N. THIRD ST.  
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## DYKEM STEEL BLUE

**Stops Losses in Making Dies and Templates**

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

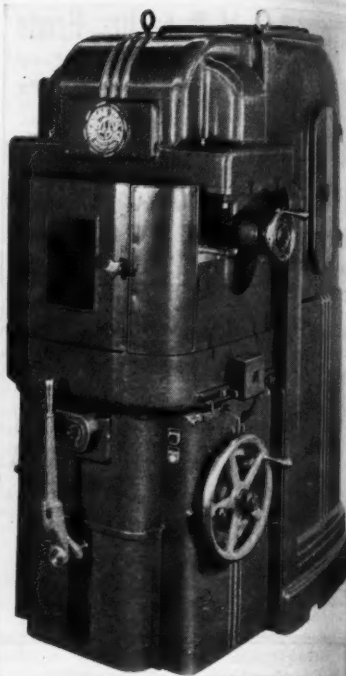
Write for full information.

**THE DYKEM COMPANY**

2301 F. NORTH 11th ST.

ST. LOUIS, MO.

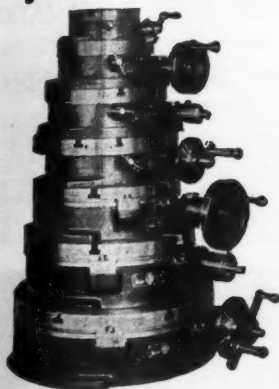
(In Canada: 444 Pacific Av., Toronto, Ont.)



Michigan 860-A Rotary Crossed-Axis Gear Finishing Machine

maintenance requirements. A "one shot" lubricating system is provided for oiling all moving parts. Control panels are enclosed for protection against dirt and dust, leaving only the simple cycle controls exposed for accessibility in machine change-overs. Cover housings are also provided with improved seals to protect against entry

## Troyke Rotary Tables



Sizes 9", 12", 15", 18"

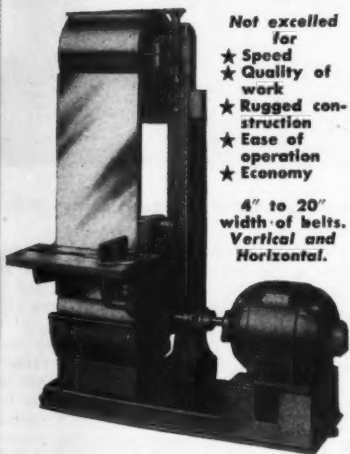
Ask your dealer or write us for  
eight page catalog.

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## PEERLESS ABRASIVE SURFACER



Not excelled  
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- ★ Speed
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4" to 20"  
width of belts.  
Vertical and  
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## HAVE AN ACE UP YOUR SLEEVE FOR POST-WAR

How about that post-war product you have been rolling around in your mind? Let Ace help you plan its construction and production. Ace has a complete service offering many real advantages to anyone considering products that involve stamping, machining, heat-treating, or grinding.

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MODERN MACHINE SHOP 315

Axis Gear

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October, 1944

## TAPPING TIPS

from Woody Spencer's Notebook



### For Copper, Skim Milk!

Skim Milk—for tapping Copper! Sounds screwy? Well, it sounded that way to me too when I first heard about it. And when I suggested it to some of the boys, all I got was a "Bronx Cheer." But I saw it work, and I never saw a smoother job... no tear, no crumble. Since then I've known a lot of copper jobs that went mighty smooth with "barnyard" lubricant. Next time you have a copper tapping job, try it.



"Tapping Tips" are no cure-all for all tapping problems. They are just intended to be helpful, perhaps to save a little time or smooth out some of the run-of-mine tapping jobs.

For a real tapping problem, we urge, "get a specific engineering recommendation." Send us complete details of your operation (material, diameter, depths and all the facts we should know). Our engineers will then be glad to make definite suggestions to cover your problem.

\*Note: Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Watch for them.



THE RIGHT TAP AT THE RIGHT TIME!

*The Wood & Spencer Company*  
Cleveland 3, Ohio

of foreign matter. Vernier scales on the front of these housings simplify crossed axis settings.

## DoAll "Zephyr" High Speed Sawing Machine

Especially designed to meet versatile sawing requirements, a high speed sawing machine to be known as the DoAll "Zephyr" is now being manufactured by Continental Machines, Inc., 1306 Washington Ave., Minneapolis 4, Minn.



DoAll "Zephyr" High Speed Sawing Machine

Rigidly constructed, the machine features a 36-inch throat depth and 12-inch work thickness capacity and is provided with speed range of from 1,000 to 10,000 feet per minute.

The speed range is infinitely controlled by a "Speedmaster" variable speed pulley. A "job selector" dial indicates the saw control factors for the shaping of 104 basic materials, including plastics, plywood, asbestos, rubber, metal sheet stock, nonferrous alloy castings, cast iron and alloy steels.

To protect the operator at the point of work, automotive hydraulic brakes are provided on the upper and lower

## GRAY TURRET HEAD METAL CUTTER OR NIBBLER



**GRAY, Originator of  
First Practical Metal  
Cutter or Nibbler**

Most modern Nibbler for  
Template Cutting, Tool  
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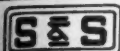
**GRAY MACHINE CO.**  
Box 596, Philadelphia, Pa.

## GEARS GOOD GEARS ONLY

**All Kinds—Any Quantity**

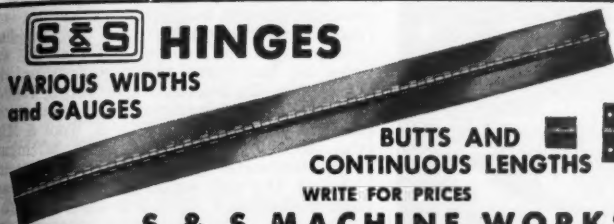
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**THE CINCINNATI GEAR CO.**  
Waester Pike Cincinnati, Ohio



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**VARIOUS WIDTHS  
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**For  
GUARDS  
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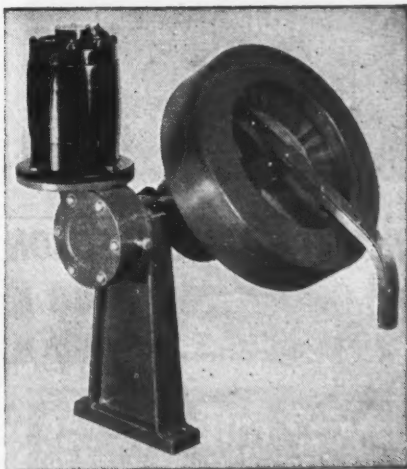
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SCREWDRIVER CO.**

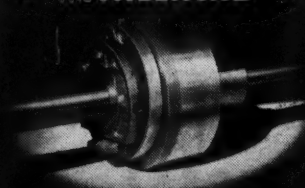
**2807 West Fort St.  
DETROIT 16 • MICHIGAN**



controls and the foot pedal controlling the hydraulic brakes are located within easy reach of the operator.

Standard equipment of the DoAll Zephyr includes a 10 h. p. variable speed drive and a 30 x 30-inch work table with a secondary table extension of 17 x 20 inches. The machine has a four-way table tilt—45 deg. to the right, 10 deg. to the left, front and rear—and an adjustable table lamp for illumination at the point of work. Pipe flange arrangements are provided for exhaust removal of chips.

★ ★ THE HILLIARD ★ ★



**SINGLE REVOLUTION** *Clutch*

*Wherever extremely accurate control of intermittent machine operation is essential the Hilliard Single Revolution Clutch is unequalled. Its accuracy has won for it the acceptance of industry for cutting, punching and packaging operations.*

★ **WRITE TO DAY!** For information that will help you to select the clutch to your needs.

**THE HILLIARD Corporation**  
117 WEST 4TH ST. ELMIRA, N. Y.

★ OVER RUNNING SLIP CENTRIFUGAL FRICTION ★

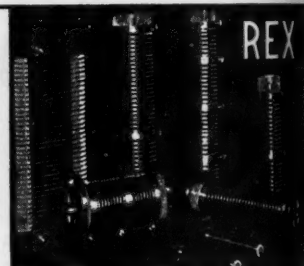
The upper wheel of the machine spring tension mounted so that the band is under proper tension at all speeds. The special saw guides provided are adjustable for saw bands from  $\frac{1}{4}$  to  $1\frac{1}{2}$  inches wide. The machine is supplied complete with assorted saw bands.

## U. S. No. T-124 Angle Correcting Radius Dresser

Designed not only to do the work of a radius dresser but also to dress the corrected radius on a wheel for grinding compound and compound-complex angles on flat form tools, and so on, the U. S. No. T-124 Angle Correcting Radius Dresser shown herewith has been placed on the market by the U. S. Tool & Machine Co., 6906 Kingsley, Dearborn, Michigan. To eliminate guesswork in dressing wheels, the unit employs the direct reading principle.

To use, the diamond dresser mechanism is swung through specific number of degrees, as indicated on graduated scale located at right angle

RHEOSTATS



**REX**

**REX RHEOSTAT CO. • Baldwin, N. Y.**

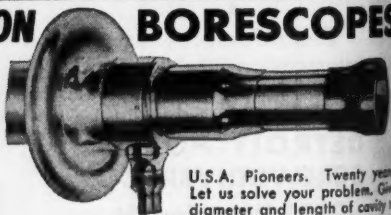
## ILLUMINATED INSPECTION



LENOX Instruments explore the dark holes of industry—guns, turbine rotors, hollow shafts, tubes, tanks, well drill pipe, cartridge cases, etc.

**LENOX INSTRUMENT COMPANY**

## BORESCOPIES



U.S.A. Pioneers. Twenty years. Let us solve your problem. Give diameter and length of cavity to be inspected.

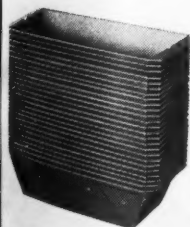
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BOXES**

*A-S-E Taper Pans—  
Saves Storage Space*

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**GITS OILERS**

**for POSITIVE,  
DEPENDABLE  
LUBRICATION  
under all conditions**

Over 30 years of specialized research, designing and manufacturing of every conceivable type of lubricator, is your guarantee of a scientific answer to all of your lubricating problems. Gravity Feed, Wick Feed, Constant Level and Multiple (manual and automatic) Oilers, Oil and Grease Seals are fully described in Catalog No. 60—write for your copy.

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445 South Kilbourn Avenue • Chicago 23, Illinois

*Exclusive for over 35 years*

# BROKEN TAPS

## Out in a Jiffy!



The Walton Tap Extractor beats out makeshift methods—saves time and money. It's insurance against trouble.

With a range of sizes to meet your needs you'll no longer be faced with production slowups caused by broken taps.

We'll show you how, and tell you about our reconditioning service for worn and damaged extractors.

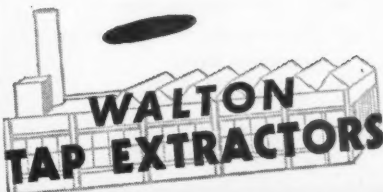
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**LIST PRICES**

From \$1.50 to \$5.00 each

**IMMEDIATE**

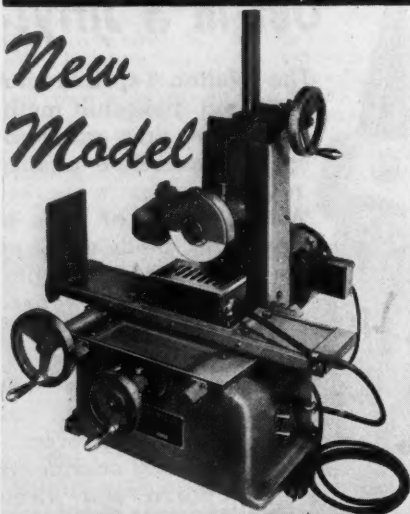
**DELIVERY**



**The WALTON Company**  
94 ALLYN STREET • HARTFORD, CONN.

# SANFORD

*New  
Model*



**HIGH SPEED  
BENCH  
SURFACE GRINDER**

**ACCURACY WITHIN .0001**

## *New Features*

- ★ Longer Stroke
- ★ Mehanite Castings
- ★ Sturdier Construction
- ★ Adjustments for Alignment
- ★ Improved Drive

**Prompt Delivery**

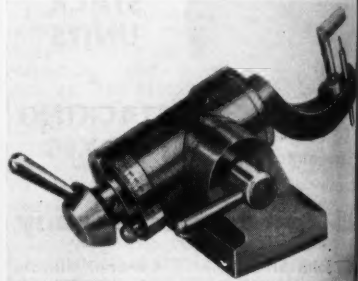
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**Available on M.R.O. Certifications**

**SANFORD MFG. CO.**  
1279-81 SPRINGFIELD AVE.  
IRVINGTON 11, NEW JERSEY

to the dressing axis, and locked in position. The dresser is then placed in the chuck exactly on the center line of the grinding wheel, which is subsequently dressed to the radius required. For compound-complex angle, the same procedure is followed with the addition of swinging the base of the dresser away from the parallel bar of the chuck using the upper righthand corner of the base of the dresser as the pivot point and directly reading the angle (from blueprint) as before.

Equipped with Timken tapered roller bearings, the U. S. No. T-124 Angle



**U. S. No. T-124 Angle Correcting Radius Dresser**

Correcting Radius Dresser is lightweight yet sturdy in construction to insure the production of smooth and precise radii. Both angle scales are easy to read and easily accessible. All exposed unpainted parts of the unit are chrome finished to guard against rust and wear. In addition, the dresser is constructed with a hardened tool steel wear plate on the underside of the base to prevent chipping and wearing of the cast iron body.

## **Tombill Drill Sharpener**

An attachment for use in sharpening twist drills from No. 70 to 15/64 inch to be known as the Tombill Drill Sharpener, is now being manufactured by Mercury Products Co., 423 Euclid Ave., Cleveland, Ohio. Designed for use with any standard 6-inch or smaller grinding wheel, the attachment includes an illuminated magnifier and alignment bar for positioning drill for sharpening.

To use, the alignment bar is pushed against the drill inserted in chuck, and chuck tightened. Next, the operator looks through magnifying glass and lines up the drill on the alignment bar. Grinding

**AMERICA'S BIGGEST  
BENCH MILL  
for only \$350.00**

## **Diamond B-12 BENCH MILL**

**IT'S STURDY!** 435 lbs. of carefully designed, accurately machined castings.

**IT'S ENGINEERED!** Timken tapered roller bearings on the spindle. Needle bearings in the overarm bracket. Spindle heat treated, nose hardened and ground. Screws protected from chips. Many modern features.

**IT'S FLEXIBLE!** A wide range of spindle speeds (from 100 to 1400 r.p.m.) for small and mill operations or heavy cuts with large diameter milling cutters. Accessories include vertical milling head, power longitudinal screw feed, rack and pinion feed, coolant supply, etc.

**IT'S POWERFUL!** Double vee belts put plenty of power on the spindle—speeds are quickly altered by flipping the belts on pulleys. Rapid belt adjustment keeps belts tight or instantly releases tension for belt changes. Recommended motor sizes  $\frac{3}{4}$  to  $1\frac{1}{2}$  h.p.

**IT'S ECONOMICAL!** Model B-12 Diamond Bench Mill is sold on M.R.O. for only \$350.00 F.O.B. Los Angeles. Write for specifications and information!

DEALERS WANTED FOR MORE INFORMATION WRITE  
**DIAMOND TOOL COMPANY**  
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MODEL B-12  
DIAMOND  
BENCH MILL

**DIAMOND**



Manufacturers of the DIAMOND Line of Precision Milling Machines and Accessories

# **C-F POSITIONERS**

## **Handle the BIG JOBS Easily and Safely**

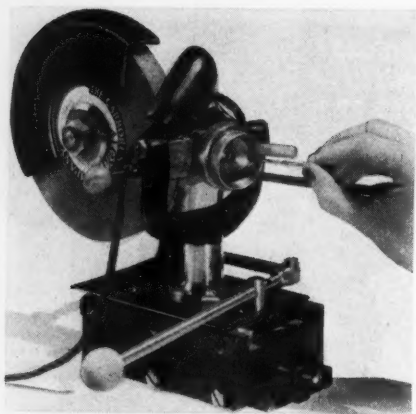
With C-F Positioners each welder can position even the most cumbersome weldments with a push button control—without crane work or handling crews. He can rotate the weldment a full 360°, rotate it at any speed from 0 R.P.M. up and can tilt it to 135° beyond horizontal... can weld all sides, surfaces and angles down-hand with a single set-up: with larger rods and fewer passes. All C-F Positioners, both stationary and portable, are pedestal mounted to give maximum floor and working clearance; all are adjustable for height.

Write for Bulletin WP-22  
**CULLEN-FRIESTEDT CO.**  
1311 S. Kilbourn Ave.  
Chicago 23, Ill.



October, 1944

MODERN MACHINE SHOP 321



**Tombill Drill Sharpener**

bar is then slowly depressed to limit and released, one lip of the drill being finish ground. To grind the other lip, the chuck is revolved 180 deg. and the grinding bar again depressed slowly and released. Every size drill to be ground on the attachment requires a separate bushing, ten of which are supplied.

### EutecRod 195

Zinc base die castings, normally difficult to repair, are said to be easily and effectively reclaimed through the use of the improved gas welding rod—EutecRod 195—now being marketed by Eutectic Welding Alloys Co., 40 Worth St., New York 13, New York.

According to the manufacturer, the improved rod has a lower melting point and lower bonding temperature than the original alloy, thus making it easier to apply without danger of damaging the parent metal. In addition, the rod is said to be easier to build up with, and have greater tensile strength.

### Beg Your Pardon!

In the announcement of the DoAll Economy Gage Block Set, which was published on page 264 of the July issue of this magazine, the wrong illustration was used. The DoAll Economy Gage Block Set actually includes 37 gage blocks as shown in the illustration.

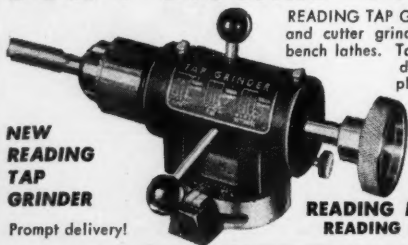
Included in the 37 blocks are two 0.050-inch wear blocks in addition to five standard series of gage blocks. The first series consists of nine blocks from 0.1001 to and including 0.1009 inch in increments of 0.0001 inch. The second series consists of nine blocks to and including 0.109 inch in increments of 0.001 inch. The third series consists of nine blocks from 0.110 to and including 0.190 in increments of 0.010 inch. The fourth series consists of five blocks



**DoAll Economy Gage Block Set**

from 0.100 to and including 0.500 inch in increments of 0.100 inch, and the fifth series consists of three blocks 1.0, 2.0 and 4.0 inches. With these several series any measurement from 0.050 to 11.7995 inches can be made in increments of 0.0001 inch.

### DON'T DISCARD DULL TAPS!



**NEW  
READING  
TAP  
GRINDER**

Prompt delivery!

READING TAP GRINDER can be used on tool and cutter grinders—surface grinders—even bench lathes. Taps sharpened after center is destroyed. **No collets.** Complete. No extras. Write!

#### Broach Keyseater

The Reading Bench Machine does not require bushings or guides. Very fast capacity from  $\frac{1}{8}$  to  $\frac{3}{4}$  cutter. Low first cost.

**READING MACHINE COMPANY  
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